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**Texas Department of
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**ACTIVITIES AND
RECOMMENDATIONS
OF THE TEXAS
GROUNDWATER
PROTECTION
COMMITTEE**

**REPORT TO THE
81st LEGISLATURE**

Prepared by the
Texas Groundwater Protection Committee

Activities and Recommendations of the Texas Groundwater Protection Committee: A Report to the 81st Legislature

Prepared by
Texas Groundwater Protection Committee

SFR-047/08
January 2009



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Abbreviations Used

ACS	Agricultural Chemicals Subcommittee
BEG	Bureau of Economic Geology
BMP	best management practices
EPA	U.S. Environmental Protection Agency
ET	evapotranspiration
ETF	Environmental Trade Fair and Conference
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	fiscal year
GAM	groundwater availability model
GCD	groundwater conservation district
GDMS	Groundwater Data Management Subcommittee
GIS	geographic information system
Joint Report	Joint Groundwater Monitoring and Contamination Report
LAR	Legislative Appropriations Request
MCL	maximum contaminant level
NPS	nonpoint source
NRCS	U.S. Department of Agriculture's Natural Resource Conservation Service
OSSF	On-Site Sewage Facility
PCB	polychlorinated biphenyl
PMP	pesticide management plan
POC	pesticides of concern
POES	Public Outreach and Education Subcommittee
POI	pesticides of interest
PWS	public water supply
RCT	Railroad Commission of Texas
RWPG	regional water planning group
SMP	state management plan
<i>Strategy</i>	<i>Texas Groundwater Protection Strategy–2003</i>
SWCD	soil and water conservation district
TAC	Texas Administrative Code
TAGD	Texas Alliance of Groundwater Districts
TCEQ	Texas Commission on Environmental Quality
TDA	Texas Department of Agriculture
TDLR	Texas Department of Licensing and Regulation
TDS	total dissolved solids
TGIC	Texas Geographic Information Council
TGPC	Texas Groundwater Protection Committee
TSSWCB	Texas State Soil and Water Conservation Board
TWC	Texas Water Code
TWDB	Texas Water Development Board
TWRI	Texas Water Resources Institute
USGS	U.S. Geological Survey
WWD/PI/ABW	water well driller/pump installer/abandoned well

Executive Summary

This report was prepared for submission to the 81st Texas Legislature by the Texas Groundwater Protection Committee (TGPC). The TGPC prepared the report as required by state law [Texas Water Code (TWC) Section 26.405]. The report provides recommendations to improve groundwater protection for Legislative consideration and describes the TGPC's activities for the preceding biennium.

Recommendations to the 81st Texas Legislature

High-quality groundwater resources are of vital importance to the state's economy and the public health and welfare. As required by TWC, 26.045, the TGPC submits the following groundwater protection recommendations for legislative consideration. More detailed information is found later in this report.

While the TGPC's recommendations represent the majority opinion of the membership, they do not necessarily reflect the views and policies of each participating organization. The recommendations are not listed in priority order.

Strengthen Groundwater Conservation and Water Quality Protection Efforts

- **Fund Brush-Control Projects to Increase Groundwater Yield—** Continue to fund the Texas State Soil and Water Conservation Board (TSSWCB) State Brush Control Program and expand it as funds become available in areas where it is found to be effective and will increase long-term availability of groundwater by increasing recharge of aquifers.
- **Encourage On-Farm Agricultural Best Management Practice Incentives through Continued Support of a Water Conservation Plan Program—**Continue support of a program to implement certified water-conservation plans on irrigated agricultural lands through the TSSWCB, with cost-share to assist in implementation of on-farm best management practices (BMPs).
- **Protect Groundwater Quality through Education Programs—** Provide funding for new groundwater education, demonstration, and outreach efforts administered by the Texas Water Resources Institute (TWRI). The efforts would be coordinated with the TGPC and other entities. The cost of the proposal is \$250,000.
- **Develop Education and Training Programs for Groundwater District Management—** provide \$150,000 annually to TWRI to work through

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Texas AgriLife Extension Service to revise, expand, and implement education and training programs for groundwater management district personnel throughout Texas.

- **Establish an Abandoned Water Well–Plugging and Education Fund**—Provide positive incentives for landowner-initiated closure of abandoned and/or deteriorated water wells through the establishment of an abandoned well–plugging fund.
- **Continue to Support the Texas High Plains Evapotranspiration Network**— Provide \$100,000 per year to Texas AgriLife Research for maintenance and scientific upgrading of the Texas High Plains Evapotranspiration (ET) Network.
- **Protect Groundwater Resources When Permitting the Injection of Carbon Dioxide for the Purposes of Geologic Sequestration** — Encourage close coordination and communication between state regulatory agencies, research institutions and groundwater planning authorities when permitting the injection of carbon dioxide for purposes of geologic sequestration, to ensure that groundwater resources are protected for future use.
- **Ensure the Brackish/Saline Aquifers Having Potential for Use as Drinking Water are Protected from Contamination** — Encourage state regulatory agencies to examine existing policies and rules to ensure that brackish and saline groundwater sources, identified as having potential use as drinking water, are adequately protected from contamination.

Advance Groundwater Management and Protection through Enhanced Data Collection and Availability

- **Expand Statewide Real-Time Groundwater-Level Monitoring System**— Provide additional funding to expand the groundwater-monitoring network from coverage in 65 counties to coverage in all 254 counties.
- **Enhance and continue to support Data and Resources in Support of “Desired Future Conditions”**— Provide additional funding to the Texas Water Development Board (TWDB) to implement House Bill 1763, 79th Legislature.

Support Groundwater Research

- **Evaluate Impact of Dryland Agriculture on Groundwater Resources in the Texas High Plains Aquifer**— Provide funding for field studies to broadly assess the impacts of dryland agriculture on groundwater recharge.
- **Study the Impact of Irrigation on Groundwater Resources in the High Plains Aquifer**— Provide funding for studies in the High Plains region to determine whether irrigation return flow has reached the aquifer or if it is still within the unsaturated zone.

- **Evaluate Characteristics of Concentrate and Residuals and Support Streamlined Permitting**—Provide funding of \$100,000 to compile existing data on the chemical composition of desalination concentrate in FY (fiscal year) 2010, which could support the general permitting process and \$150,000 to complement and match federal funds currently being used by universities to develop advanced desalination technologies. Priority areas for study would be based on identified need in the State Water Plan.
- **Acquire and Analyze Brackish Groundwater Data**—Provide funding to the TWDB for 2.5 full time employees and \$500,000 in appropriations to acquire and analyze brackish groundwater data and assess groundwater modeling techniques to predict brackish aquifer performance.

TGPC Activities 2007-08

The TGPC implements and coordinates projects and administrative requirements that address eight topical areas:

- Implementation of the objectives found in the Texas Groundwater Protection Strategy[2003] (*Strategy*);
- Agricultural Chemical Activities;
- Groundwater Data Management Activities;
- Nonpoint Source Pollution Activities;
- Public Outreach and Education Activities;
- Groundwater Research Activities;
- Intergovernmental Cooperation Activities; and
- TGPC Administrative Activities.

Implementation of the Objectives Found in the *Texas Groundwater Protection Strategy [2003]*

The Legislature charged the TGPC with developing and updating a comprehensive groundwater protection strategy that includes guidelines for the prevention of contamination, the conservation of groundwater, and the coordination of the groundwater protection activities of the agencies and entities represented on the TGPC. In February 2003, the TGPC updated the *Strategy*. Over the last biennium, the TGPC has continued to use existing policy and programmatic direction given by the Legislature as the basis for *Strategy* implementation. The *Strategy* also provides recommendations and possible actions that should be taken over the next five to 10 years to enhance protection of groundwater. Progress in implementing these recommendations is delineated within this report and in Appendix 2.

Agricultural Chemical Activities

At the request of the Texas Commission on Environmental Quality (TCEQ), in 2001, the TGPC developed the *Texas State Management Plan for Prevention of Pesticide Contamination of Groundwater* (Also known as the Pesticide Management Plan or PMP). This generic management plan for the state serves as a guide for the prevention of pesticide contamination of groundwater. Over the biennium, the Agricultural Chemicals Subcommittee (ACS) of the TGPC has been working on three areas of the PMP: (1) continued cooperative groundwater monitoring; (2) responding to confirmed cases of pesticide contamination of groundwater; and (3) identifying and providing outreach on BMPs in problem areas. These efforts are discussed in the report and more detail is provided on the program in Appendix 3.

Groundwater Data Management Activities

Sound management of groundwater data is fundamental to protecting water quality and ensuring adequate groundwater supplies. The TGPC makes use of the expertise of its members and other experts through the Groundwater Data Management Subcommittee (GDMS) to address many of the recommendations found in the *Strategy*. The TGPC also uses the GDMS to make available information on groundwater contamination and water-quality assessments of the state's aquifers to the public through the publication of two reports mandated by both the state and the federal government. The subcommittee coordinates the compilation of data to be assessed by the TGPC and its member agencies and organizations to satisfy direct or indirect state and federal mandates. These efforts are discussed in the report and more detail is provided in Appendix 4 of the *Joint Groundwater Monitoring and Contamination Report (Joint Report)*.

Nonpoint Source Pollution Activities

The committee has changed the former Nonpoint Source (NPS) Task Force to the NPS Management Plan Task Force. The NPS Task Force will be activated for contribution to the development of the *NPS Management Plan*, every five years. Additionally, the TSSWCB representative to the committee will serve as liaison between the committee and agency NPS programs, and facilitate information exchange on both ground and surface water NPS issues.

Public Outreach and Education Activities

Activities during the biennium centered on two overarching themes: the protection of groundwater from contamination, and the protection of human health from contaminated groundwater

or water that contains high levels of naturally occurring compounds that could affect human health. The Public Outreach and Education Subcommittee (POES) coordinates many of the TGPC's educational outreach initiatives. Educational efforts over the biennium focused on:

- demonstrations of procedures to plug abandoned wells;
- developing and publishing fact sheets in both English and Spanish on arsenic, perchlorate, nitrate, and radionuclide contamination for private well owners;
- outreach to users of the pesticide atrazine in the Panhandle on BMPs to prevent contamination of groundwater;
- developing two fact sheets about on-site wastewater treatment systems for homeowners; and
- updating the TGPC web site with new information on groundwater protection.

Groundwater Research Activities

The TGPC identifies interagency research needs and provides a forum for a coordinated approach for discussion about funding with federal agencies through the Groundwater Research Subcommittee. During the biennium, the subcommittee developed a template for project-specific white papers and identified a number of research topics.

Intergovernmental Cooperation Activities

The TGPC and its subcommittees undertake intergovernmental efforts to fill gaps in service delivery and information exchange. These include: (1) notifying private well owners of groundwater contamination; (2) coordination with regional water planning groups (RWPGs); and (3) coordination with federal agencies.

TGPC Administrative Activities

The TGPC carries out numerous administrative duties required by state law, such as developing this biennial report to the Texas Legislature, holding required quarterly meetings, and ensuring that documents are maintained in a manner that makes them easily accessible to the public. In addition, the TGPC and its subcommittees are subject to the state's open-meeting laws. Periodically, state laws are enacted that require the committee to undertake rulemaking and the TGPC completed its rules review and readoption this biennium. Much of the TGPC's work is performed in quarterly meetings and through the efforts of its subcommittees.

Recommendations to the 81st Texas Legislature

State law (TWC §26.405) requires the TGPC to develop legislative recommendations. Fourteen groundwater protection recommendations are presented requesting legislative consideration in three topical areas: strengthen groundwater conservation and water quality protection efforts, advance groundwater management and protection through enhanced data collection and availability, and support of groundwater research. Some of these recommendations can be found in the Legislative Appropriation Requests of the individual TGPC member agencies.

While the TGPC's recommendations represent the majority opinion of the membership, they do not necessarily reflect the views and policies of each participating organization. Recommendations are outlined below and are not listed in priority order. A detailed discussion follows.

Strengthen Groundwater Conservation and Water Quality Protection Efforts

Fund Brush-Control Projects to Increase Groundwater Yield

Issue. The U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS) estimates that brush in Texas uses approximately 10 million acre-feet (over 3 trillion gallons) of water annually. Control of brush potentially offers a cost-effective means for significantly increasing the availability of both ground and surface water for the growing needs of Texans.

Recommendation. Continue to fund the TSSWCB State Brush Control Program and to expand it as funds become available in areas where it is found to be effective and will increase long-term availability of groundwater by increasing recharge of aquifers.

The TSSWCB is requesting approximately \$3.3 million in its base funding for FY 2010-11 for brush control. Included in TSSWCB legislative request are exceptional items totaling approximately \$24.9 million for additional brush control activities. The requested funding would be for financial and technical assistance for brush control projects.

Background. In 1985, the Legislature, created the Texas Brush Control Program. The goal of this program is to enhance the state's water resources through selective control of brush species.

The TSSWCB is designated as the agency responsible for administering the program and is given authority to delegate responsibility for administering certain portions of the program to local soil and water conservation districts (SWCDs).

In 1986, the TSSWCB prepared and adopted a State Brush Control Plan. The plan includes a comprehensive strategy for managing brush in areas where brush is contributing to a substantial water conservation problem and designates areas of critical need in the state in which to implement the brush control program. It was last revised in January 2005.

The Agriculture Code also requires that the TSSWCB submit a report on the activities of the brush control program to the Governor, the Speaker of the House, and the Lieutenant Governor before January 31 of each year. The Agricultural Code created a cost share program for brush control, created the Brush Control Fund, limits the cost share rate to 70% of the total cost of a practice, limits the cost share program to critical areas designated by the TSSWCB, and limits methods of brush control approved by the TSSWCB. It also establishes criteria for approving applications, setting priorities, and contracting for cost sharing.

The North Concho River watershed brush control project began in 1999 and is nearing completion. Other brush control projects include Twin Buttes, Pecos River/Upper Colorado River, Lake Ballinger, Oak Creek Lake, Lake Champion, Canadian River, Hubbard Creek Lake, and Pedernales River watersheds. Approximately \$18,000,000 is needed to complete these projects.

TSSWCB conducted feasibility studies on these and other watersheds to estimate the probable water yield and cost of the water resulting from a brush control project. These feasibility studies include extensive hydrologic and economic modeling. Over the next 10 years, a substantial investment would be required to complete the brush control for water yield as recommended in the completed feasibility studies. See Table 1 on page 3.

Table 1. Watersheds and Cost from the Feasibility Studies

Watershed	Total Cost	(\$) Average Cost (\$/ac-ft)
Lake Brownwood	\$ 49,948,000	37.95
Fort Phantom Hill Reservoir	10,189,000	29.45
Lake Arrowhead	17,546,000	14.83
Palo Pinto Reservoir	14,332,000	24.09
Frio River Basin	65,368,000	36.95
Nueces River Basin	250,311,000	46.62
Wichita River Basin	43,395,000	36.59
Canadian River Basin	77,845,000	111.37
<i>Edwards Aquifer watersheds:</i>		
• Hondo watershed	2,176,000	29.92
• Medina watershed	10,658,000	26.68
• Sabinal watershed	5,714,000	42.04
• Seco Creek watershed	1,665,000	35.33
• Upper Frio watershed	8,387,000	51.65
• Upper Nueces watershed	85,889,000	97.51

Encourage On-Farm Agricultural Best Management Practice Incentives through Continued Support of a Water Conservation Plan Program

Issue. In the 2007 State Water Plan, it is reported that in 2000, over 10 million acre-feet of water was used for irrigation. Municipal water usage was reported to be approximately 4 million acre-feet in 2000. However, municipal water usage is expected to double by 2060. Increasing the efficiency of irrigation water usage while maintaining the current level of irrigated land will help ensure the availability of water for Texas' growing population.

Recommendation. Continue a program to implement certified water-conservation plans on irrigated agricultural lands through the TSSWCB, with cost-share to assist in implementation of on-farm BMPs. These plans would be similar to the TSSWCB water-quality management plans but would require BMPs that have a water conservation component. Cost estimates of a water conservation plan program range from \$100,000 per biennium for implementing 10 water conservation plans per biennium using existing staff to \$2.5 million per biennium for implementing 200 plans, which would require funding for an additional technical employee in each TSSWCB regional office in irrigated areas.

Background. A water conservation plan would be an integrated management plan that comprises a collection of BMPs that are appropriate to the individual agricultural operation. The plan is developed by the farmer or rancher in cooperation with a plan-

ner or technician with TSSWCB, SWCD, or NRCS. If it meets all technical criteria, it is then certified by TSSWCB. The practices that have a cost to implement may be eligible for cost-share assistance. To be eligible for cost-share assistance, the farmer or rancher would have to agree to implement and maintain the plan for the expected life of the practices. After an eligible practice is implemented and implementation is certified by the SWCD, the producer may receive cost-share assistance for that practice. A plan must clearly demonstrate water savings for it to be certified by TSSWCB or to be eligible for cost-share assistance. These plans would be developed and implemented through existing TSSWCB regional offices and SWCD's that currently work with farmers to implement water-quality management plans and administer the TSSWCB water-quality cost-share program. TSSWCB regional offices working in areas with significant irrigation agriculture are located in Hale Center, Harlingen, Wharton, and Dublin.

Costs are estimates based on TSSWCB's experience with the water quality management plan program. There is a wide variety in the number of plans that can be developed, depending on the complexity of the plan, the size of the operation, the number of BMPs, and the type of irrigation systems that are involved. The cost-share per plan can also vary widely for the same reasons.

Implementing a state water conservation plan program will allow the most effective use of cost-share funds and attract federal funds through partnerships with the U.S. Department of Agriculture's NRCS and the U.S. Environmental Protection Agency (EPA) in those areas where program goals coincide.

Protect Groundwater Quality through Education Programs

Issue. To best protect groundwater quality, a variety of education programs are needed to transmit information to the public. These programs will provide resources for water resources managers and agency personnel to demonstrate use of innovative technologies and management strategies.

Recommendation. Provide funding for ongoing groundwater education, demonstration, and outreach efforts administered by the Texas AgriLife Extension Service and TWRI. The efforts would be coordinated with the TGPC and other entities. The cost of the proposal is \$250,000 annually.

Background. Several groundwater education programs are already in place, led both by the Texas AgriLife Extension Service and several other agencies and entities. Some of the broad topics addressed by these education programs include the following:

- Protection of drinking water wells and areas where wellheads are located;
- Ways to ensure that wellheads are not contaminated and abandoned wells are properly plugged;
- Proper selection, use, and management of on-site wastewater treatment systems;
- Actions agricultural producers can take to reduce pesticide use and limit the risk of degrading groundwater quality; and
- Give demonstrations that show how to plug abandoned wells and how individuals can take groundwater quality samples.

These educational programs need continued financial support to achieve long-term results. In addition, new efforts needed to address issues include:

- Preparing individuals and groundwater suppliers to deal with threats to water quality;
- Explaining the economic benefits of protecting groundwater quality;
- Encouraging stakeholders to participate in discussions about current groundwater quality and quantity issues and help identify future water needs;
- Identifying new and emerging technologies that have a significant potential to treat and remove groundwater contaminants; and
- Providing urban/suburban/rural fringe education:
 - New urban/suburban homeowners/landowners and pesticide/herbicide and fertilizer application;
 - New suburban/rural landowners and their groundwater wells and on-site wastewater treatment systems;
 - New suburban/rural landowners and Groundwater Conservation Districts (GCDs); and
 - New rural landowners and oil/gas wells (plugging, conversion into water wells, and groundwater wells supporting oil/gas wells).

Develop Education and Training Programs for Groundwater District Management

Issue: Groundwater districts require continuing education to upgrade their knowledge sets and skills related to such rapidly changing issues as groundwater planning and management, conservation, water quality protection, the use of new technologies and management models, and coping with evolving laws, regulations and policies. In addition, there is also a need for educational materials (for example, fact sheets, reports, websites, instructional video, etc.) to be created and distributed to support district personnel training programs. Developing, updating and

implementing a comprehensive training program that educates as many groundwater district personnel as possible will help ensure that Texas groundwater resources will be used wisely and properly protected by knowledgeable people.

Recommendation: This request asks the Texas Legislature to provide \$150,000 annually for TWRI to work through Texas AgriLife Extension Service to revise, expand, and implement education and training programs for groundwater management district personnel throughout Texas. Education, demonstration, and outreach efforts will be administered by AgriLife Extension and TWRI. The programs will be coordinated with the TGPC, the Texas Alliance of Groundwater Districts (TAGD), and other appropriate agencies and entities.

Background: For several years, Texas AgriLife Extension Service, working with TWRI, has implemented continuing education programs targeted to groundwater district personnel at locations throughout the state. Topics covered by AgriLife Extension and TWRI training programs have covered several key issues related to groundwater protection and management. Several AgriLife Extension fact sheets, which are made available to the public, have been published as a result of the training. Building on the existing educational base will be cost effective and efficient. Sustaining funding will provide for updates of material to capture legislative actions and regulatory changes.

Establish an Abandoned Water Well–Plugging and Education Fund

Issue. Numerous state and local programs have identified abandoned and/or deteriorated water wells as having a significant, or potentially significant, negative impact on the quality of groundwater in the state. Abandoned water wells not only serve as conduits or channels for contamination to reach groundwater, but large diameter wells can also be a hazard to human and animal life. Financial resources are not currently available to provide education programs and technical assistance to landowners, GCDs, or local governments to plug abandoned wells.

Recommendation. Provide positive incentives for landowner-initiated closure of abandoned and/or deteriorated water wells through the establishment of an abandoned well–plugging fund.

Fund disbursement would be contingent upon prioritization of potential groundwater quality impacts, hazards, and the landowner’s assets. Further, the plugging fund program should be administered by the Texas Department of Licensing and Regulation (TDLR), the agency currently responsible for the oversight of water well drillers, well drilling and well plugging.

TDLR would work cooperatively with local GCDs to disburse monies for the plugging of abandoned and/or deteriorated water wells located within GCD jurisdiction. Furthermore, the funds would be disbursed on a regional geographic model based on the areas of selection for member appointment to the Water Well Driller Advisory Council. Because of the number of abandoned wells and the ability to “scale” the program, a cost estimate cannot be provided and has not been submitted by any member agency in a Legislative Appropriation Request.

To support the abandoned well plugging program, it is recommended that an outreach program be developed by Texas AgriLife Extension through the TWRI. This program would create educational publications, websites, and other resources that could be used by county extension agents and other local and regional agencies in workshops and field days to teach the public how to properly plug and manage abandoned water wells.

Background. Abandoned and deteriorated water wells remain at the top of the list of potential groundwater contamination sources, which landowners can identify and eliminate. Uncapped, non-cemented, deteriorated, or uncased wells provide a direct path to groundwater from activities at the surface. Deteriorated wells completed in more than one water-bearing zone may allow poorer-quality water from one zone to commingle with and impact the other(s). Abandoned domestic, municipal, industrial, irrigation, and livestock wells, and unplugged test-holes pose threats to groundwater quality. Abandoned water wells exist in every county of the state and impact all of the State’s aquifers.

The Abandoned Well Notification and Enforcement Program, administered by the TDLR utilizing the Water Well Driller/Pump Installer Program, investigates, compiles, identifies, and processes abandoned water well notifications and enforcement cases. Groundwater quality degradation, due in part to abandoned water wells, has also been documented by GCDs, the Bureau of Economic Geology (BEG), TWDB studies, and the TCEQ’s Source Water Assessment and Protection Program. Furthermore, Senate Bill 279 of the 78th Legislature (TDLR’s Sunset Bill) enhanced the investigatory procedures and referrals of documented abandoned and/or deteriorated wells. A Memorandum of Understanding has been developed to coordinate the efforts of the TDLR, GCDs, and the field offices of the TCEQ relating to investigative procedures for referrals of complaints regarding abandoned and/or deteriorated wells.

The exact number of water wells in the state is unknown. However—based on TWDB records and the TDLR/TWDB Online Well Report Submission and Retrieval System—since 1965 (the initial date when well reports were recommended to be submitted to

the state) and through FY 2006, a total of 669,233 State of Texas Well Reports (for water wells drilled) have been submitted (which is not 100% of the wells drilled since 1965). Submission of water well reports was not required until December 1, 2003 (16 Texas Administrative Code (TAC) §76.700). In addition to that amount, it is conservatively estimated that there are 150,000 abandoned and/or deteriorated water wells in Texas.

Texas Occupations Code §1901, “Water Well Drillers,” requires landowners or other persons who possess an abandoned and/or deteriorated well to have the well plugged or capped under standards and procedures adopted by the TDLR (16 TAC §76.1004). Texas Occupations Code §1901 also authorizes the TDLR to assess administrative and civil penalties against persons who do not comply with the provisions of the chapter. However, these provisions represent a financial burden and provide little incentive for owners of abandoned wells to voluntarily plug abandoned wells. In addition, consideration should be given to the origin of groundwater contamination in the water well to be plugged, if present.

Educational efforts, such as the TGPC’s *Landowner’s Guide to Plugging Abandoned Water Wells* and the associated video, may initiate some abandoned well plugging. However, a funding source to assist landowners with abandoned well plugging efforts would result in an increase in the number of wells plugged and thus decrease the threats to groundwater quality.

Well-plugging costs to landowners (well owners) could range from approximately \$100 to in excess of \$120,000 per well. Cost is based on well depth, size of casing, and complexity of properly plugging the well in compliance with 16 TAC §76 water well-plugging specifications.

The abandoned well-plugging fund could be a pilot project whereby TDLR, in conjunction with GCDs, would prioritize the abandoned and/or deteriorated water wells with regard to the potential of impacts to groundwater quality and/or human health. Fund disbursement would be contingent upon this prioritization and the landowner’s assets.

The development of the plugging fund would provide criteria for the landowner or person possessing the abandoned and/or deteriorated water well who does not have sufficient assets to plug the well. When making application for abandoned water well-plugging fund disbursement, the applicant would be required to submit a signed and notarized affidavit stating that they are financially incapable of plugging the well.

The development of the plugging fund would also provide for a disbursement ceiling approved by the TDLR executive director.

Requests for amounts above the set ceiling would require Texas Commission of Licensing and Regulation approval.

TWRI requests that \$150,000 annually be designated by the Legislature to support the education and outreach program to support efforts to plug and manage abandoned water wells.

Continue to Support the Texas High Plains Evapotranspiration Network

Issue. Water level in the Ogallala aquifer is declining. The ongoing Ogallala aquifer research funded by the US Department of Agriculture along with the TWDB funded demonstration project are generating much needed information on water conservation in the Texas High Plains. However, irrigation farmers need spatially and temporally accurate information about crop water requirements in order to conserve the aquifer and cost-effectively irrigate their crops.

Recommendation. Provide \$100,000 per year to the Texas AgriLife Research for maintenance and scientific upgrading of the Texas High Plains ET Network.

Background. The Texas High Plains ET Network provides valuable ET data and technical support to farmers, irrigation districts, university research, extension, and industry to foster irrigation water conservation.

The Network's mission is to provide up-to-date information on crop water use to assist in making decisions regarding agricultural irrigation operations.

The Texas High Plains ET Network is a critical component and source of ET information used by farmers throughout the High Plains and much of West Texas. This information is provided electronically to producers to enable them to match irrigation amounts with the changing demands of their crops and the weather. Without this spatially and temporally accurate information, farmers could easily over- or under-irrigate, wasting precious water from the aquifer and/or reducing crop yields and profits.

Cooperative ongoing research currently funded by the states of Texas and Kansas and the federal government, is developing technology and science designed to enhance water use efficiency and promote aquifer sustainability. This scientifically sound data is being provided to water users, planners and policymakers in order to develop effective water management policies that balance the economic, environmental, and social concerns for the Ogallala aquifer. The Texas High Plains ET Network is a critical component and source of ET information used in this cooperative research effort.

The Texas High Plains ET Network is also a critical component and source of ET information for research and demonstrations conducted by Texas Tech University in cooperation with the High Plains Underground Water Conservation District, Texas AgriLife Extension Service, and agricultural producers in Floyd and Hale Counties. These cooperators use the Network's ET data to verify and demonstrate environmentally sustainable and economically feasible integrated production systems that will ensure the continued viability of agricultural activities in the Texas High Plains. This demonstration effort is funded by the TWDB and is expected to continue through 2013. The integrated agricultural systems identified through these research and demonstration efforts are expected to conserve water and extend the useful life of the Ogallala aquifer; reduce soil erosion; improve air and water quality, wildlife habitat, and recreational opportunities; increase geologic sequestration; promote soil fertility and soil microbial activity; and enhance individual and community well-being.

Protect Groundwater Resources When Permitting the Injection of Carbon Dioxide for the Purposes of Geologic Sequestration

Issue: State regulatory agencies need to ensure that existing or potential sources of usable groundwater are protected from impacts from the geologic sequestration of carbon dioxide.

Recommendation: Encourage close coordination and communication between federal and state regulatory agencies, research institutions and groundwater planning authorities when permitting the injection of carbon dioxide for purposes of geologic sequestration, to ensure that groundwater resources are protected from detrimental alteration, and retain their potential for future use.

Background: Injection of carbon dioxide for enhanced oilfield recovery is an established practice, with proven technologies. Injection of carbon dioxide for the purpose of sequestration uses the same technology, and generally, oil-depleted rock strata has been proposed as the repository for those gases in this state. Other states, however, have proposed the use of saline aquifers as the receiving geologic formations for injected carbon dioxide.

The United States Environmental Protection Agency has proposed rules for carbon dioxide sequestration. These rules propose a hybrid of the existing Class I and Class V Underground Injection Control rules, and have been classified as a new category, the Class VI injection well.

While sequestered, carbon dioxide may chemically react with the host geologic formations or with groundwater that may be present in the host

formation, causing unanticipated consequences, and possibly a loss of integrity in the confining strata.

Ensure the Brackish/Saline Aquifers Having Potential for Use as Drinking Water Are Protected From Contamination

Issue: TWC, § 26.401 stipulates that, in order to safeguard usable and potentially usable groundwater, it the policy of this state that discharges of pollutants, disposal of wastes, or other activities subject to regulation by state agencies be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard. Brackish groundwater and certain saline groundwater is gaining importance as a source of drinking water now and in the future. Regulatory programs may not have anticipated the potential use of brackish and certain saline water for human consumption, and therefore may not have provided adequate protection of the resource from pollutant discharge or other contamination.

Recommendation: Encourage state regulatory agencies to examine existing policies and rules to ensure that brackish and saline groundwater sources, identified as having potential use as drinking water, are adequately protected from contamination.

Background: Brackish groundwater is defined as groundwater containing between 1,000 and 10,000 milligrams per liter (mg/L) total dissolved solids (TDS), while saline water is defined as having a TDS content of greater than 10,000 milligrams per liter. Brackish and saline groundwater can be found throughout all of the regions of the state. As water demands increase and freshwater supplies decrease, more cost-effective desalination technologies are widespread use of the resource for drinking water supplies.

Currently, there are approximately 100 public water systems in Texas using desalination to treat nearly 80 million gallons of water per day, and, according to the 2007 State Water Plan, 3.5 percent of the new water supplies to be developed by 2060 will be provided by desalination. Brackish groundwater sources for desalination were identified in a TWDB report as to location and amount available for desalination. The total estimated volume of brackish groundwater “in place” in Texas aquifers is over 2.5 billion acre-feet.

Current regulatory practices, including risk reduction programs, generally afford slightly less protection to brackish or saline groundwater than they do for fresh groundwater supplies. Rules and policies need to provide protection necessary to maintain suitability of brackish and saline groundwater that is identified as

having potential for use as drinking water, for cost effective desalination treatment.

Advance Groundwater Management and Protection through Enhanced Data Collection and Availability

To ensure the best management of the state's groundwater supply, local and regional planning groups must develop approaches and management methodologies based on high-quality groundwater data; real-time groundwater data; information developed from the completion of groundwater availability models (GAMs) for all of the state's minor aquifers; and sound, defensible determinations of desired future conditions and calculations of managed available groundwater. Existing data need to be captured into a user friendly database.

Expand Statewide Real-Time Groundwater-Level Monitoring System

Issue. Texans need real-time water-level information to manage their groundwater resources. Such information helps RWPGs and water suppliers develop drought management plans, and individual well owners understand current conditions within an aquifer. Real-time water-level information is used by GCDs and interested citizens to monitor the day-to-day changes in water levels in the aquifer. For example, real-time water levels are measured in the Edwards aquifer to determine different drought stages in the aquifer.

Real-time water-level information is obtained by equipping a well with automated water-level measuring equipment and a transmitter to send information to a central location for posting on the internet. The state's current real-time monitoring network has 82 monitoring stations in 64 counties. However, the current network is inadequate for assessing all of the state's groundwater resources.

Forty-eight predominantly single-county GCDs and 97 counties with no districts currently do not have the necessary resources to monitor groundwater levels and host online, real-time water-level information.

Recommendation. Provide additional funding to expand the groundwater-monitoring network from coverage in 65 counties to coverage in all 254 counties. This expansion will help achieve parity in the geographic distribution of all real-time monitoring sites and provide all counties with at least one real-time recorder to complete the network. The TWDB's FY 2010-11 Legislative

Appropriations Request (LAR) to fund the recorder program is \$1,151,722.

Background. The TWDB has operated recorders throughout the state for several decades. In the past ten years, it has become more important to make the collection of recorder data automatic, through the installation of dataloggers and water-level measuring devices, and to make these data available more quickly. The Legislature’s passage of Senate Bill 1 funded TWDB efforts to launch a real-time recorder program and publish water levels online. The agency continues to operate and enhance this program through upgrading its sites to satellite telemetry. Other GCDs and universities also are publishing their real-time data on the TWDB web site. The continued development and maintenance of this program will allow for the purchase, installation, and maintenance of recorders in all areas of Texas and the dissemination of this information to the public in “real time.”

Enhance and Continue Support of Data and Resources to Support “Desired Future Conditions”

Issue. House Bill 1763 enacted by the 79th Legislature in 2005 requires GCDs to determine the “desired future conditions” of their groundwater resources and the TWDB to provide estimates of managed available groundwater to the districts and the RWPGs. People with defined interests in groundwater can petition the TWDB if they believe that the “desired future conditions” determined by GCDs are not reasonable. When House Bill 1763 enacted by the 79th Legislature was being considered, the TWDB submitted a fiscal note, approved by the Legislative Budget Board, that included additional employees to implement the bill. House Bill 1763 was approved toward the end of the session and there was insufficient time to consider appropriations for the fiscal note.

Recommendation. Provide the TWDB with the funding necessary to implement House Bill 1763. The TWDB requests four employees to implement the program. Three geologists would provide technical assistance to the districts to help them identify defensible future conditions and to run GAMs. One attorney would assist with legal issues associated with groundwater management areas, including petitions against “desired future conditions” determinations. The TWDB’s FY 2010-11 LAR to fund support for groundwater management areas is \$412,489.

Background. With House Bill 1763, the 79th Legislature greatly expanded the role of groundwater management areas in managing the groundwater resources of Texas. GCDs in each of the sixteen groundwater management areas now are required to meet to decide the “desired future conditions” of their groundwater

resources. The “desired future conditions” then are used to calculate the “managed available groundwater,” which is the amount of groundwater available for permitting and the amount of groundwater available to meet future demands in regional water planning.

The process of deciding “desired future conditions,” calculating “managed available groundwater,” and responding to petitions against desired future conditions requires considerable technical and legal support, especially if the state desires defensible numbers.

Support Groundwater Research

Evaluate Impact of Dryland Agriculture on Groundwater Resources in the Texas High Plains Aquifer

Issue. Large-scale groundwater-level rises have been recorded in some areas of the High Plains aquifer. For example, groundwater levels have risen by an average of 20 ft over a 1,300-mi² area near Dawson County. Recent studies indicate that increased recharge in this area is related to conversion of rangeland to dryland agriculture. However, the mechanism or the controls on the increased recharge are not well understood. Increased recharge may be related to winter fallowing in dryland agriculture, to modification of the land surface associated with tillage, or to the shorter crop-growing season. Currently 44% of the southern High Plains is rangeland; therefore, there is potential for further expansion of dryland agriculture; however, potential degradation from wind and water erosion would need to be considered. The Conservation Reserve Program also results in cropland being taken out of production that may return to cropland. The impact of past and projected future land use changes on water resources requires fundamental information on how dryland agriculture impacts water resources, including mechanisms and controls of recharge variations related to cultivation.

Recommendation. Provide funding for field studies to broadly assess the impacts of dryland agriculture on groundwater recharge.

ET should be monitored using various approaches, including satellite and ground-based point measurements to evaluate differences in ET between rangeland and dryland areas. These measurements would test the hypothesis of whether winter fallowing or shorter summer growing season lengths are possible explanations for increased recharge in dryland areas. Drilling and sampling should be conducted in areas of different soil textures and varying agricultural management practices, such as conventional versus conservation tillage or different crop

rotations, to determine how these factors impact recharge. The results of these studies will provide critical information for linking agricultural land management and its impacts on subsurface groundwater resources and would allow quantification of land use change impacts on groundwater resources. The total cost is \$500,000 over two years.

Background. Recent studies that evaluated groundwater level trends in the Texas High Plains aquifer revealed some large areas, particularly in the vicinity of Dawson county, where groundwater levels had risen by an average of 20 ft in the last few decades. Unsaturated zone studies indicated that the most likely cause of increased recharge was related to land use change and increased recharge correlated with areas of dryland agriculture. However, the studies did not address the actual causes of increased recharge, such as reduced ET during fallow periods, effect of tilling etc., on groundwater recharge. Controls on increased recharge were also not examined in these previous studies. Expanding the previous studies to address mechanisms and controls on recharge related to agriculture through field studies and numerical modeling would provide the necessary information to water resource managers to assess impacts of past and projected future land use changes on groundwater resources.

Study the Impact of Irrigation on Groundwater Resources in the High Plains Aquifer

Issue. Irrigation is the primary consumer of groundwater in the High Plains in Texas. Excess water applied to crops results in drainage of water below the root zone (irrigation return water) that ultimately recharges the underlying aquifer. Limited recent studies by the U.S. Geological Survey (USGS) and the BEG in the Texas High Plains indicate that irrigation return water is still within the unsaturated zone at the three sites tested and has not reached the underlying Ogallala aquifer. The regional applicability of these results needs to be evaluated. Understanding the location of irrigation return flow and whether it has reached the aquifer or how long it will take to reach the aquifer will have important impacts on future groundwater resources.

Recommendation. Provide funding for studies in the High Plains region to determine whether irrigation return flow has reached the aquifer or if it is still within the unsaturated zone.

If irrigation return flow is still within the unsaturated zone, the timing of when it would reach the saturated zone can be determined from the field studies. Measurements need to be conducted over a broad spectrum of soil and geologic settings and in different types of irrigation practices (furrow irrigated, converted furrow to pivot, and newer pivot systems). Numerical modeling analyses should also be conducted to estimate timing

of irrigation return flow to the aquifer and impacts on water quantity. Characterization of solutes in the soil water that can be mobilized by irrigation return flow will also provide information on the potential negative impacts of irrigation water on groundwater quality in the High Plains, particularly with respect to nitrate. Total cost is \$600,000 over three years.

Background. Recent drilling and sampling studies conducted by the USGS National Water Quality Assessment Program and by the BEG indicated that irrigation return flow is within the unsaturated zone and has not reached the underlying aquifer. Travel velocities of irrigation return flow from these studies ranged from 0.3 to 1 ft per year. These studies were restricted to three sites, and it is important to determine whether these results apply to the regional aquifer, to assess the status of irrigation return flow on a regional scale, and project potential impacts of recharge of irrigation return flow on groundwater levels and water resources.

Evaluate Characteristics of Desalination Concentrate and Residual and Support Streamlined Permitting

Issue. New regulations present challenges arising from the management of concentrates generated by: (1) treatment of saline waters for public consumption; and (2) treatments resulting from new drinking water standards. The chemical characteristics of the concentrates generated from desalination and other treatment depends on the original concentration in the source water, the degree of concentration that the treatment process provides, any chemicals added during pretreatment of the source water, and cleaning of the treatment membranes.

To appropriately use or dispose of the concentrates, there is a need to know both the chemical constituents, and concentration levels present in the concentrate. This research will provide information that will be useful in determining the appropriate disposal method(s), such as underground injection, and identification of possible disposal problems, such as negative interactions between the concentrate and the targeted injection zone. This information would make possible the issuance of streamlined general permits.

Recommendation. Provide funding of \$100,000 to compile existing data on the chemical composition of the desalination concentrate in FY 2010, which could support the general permitting process and \$150,000 to complement and match federal funds currently being used by universities to develop advanced desalination technologies. Priority areas for study would be based on identified need in the State Water Plan. This item has not been identified as an exceptional item request by any of the members of the TGPC.

Background. There are many existing and ongoing studies of desalination or other treatment methods to meet drinking water standards. Once compiled, information on the composition of the treatment by-product waste revealed by these studies and specified in existing permits can be used to support the streamlining efforts for disposal permitting. Ongoing long term collaborative research by the University of Texas-Austin and Texas A&M University system to develop information on the chemical constituents and levels contained in brackish/saline water concentrates, and drinking water treatment residuals bench testing, should be prioritized by identified need in the Texas State Water Plan. This will be accomplished by collecting samples of concentrate and residuals from bench-scale or pilot-scale treatment of water and analyzing them for relevant parameters. The results will then be modeled to determine comparability and compatibility with target injection formations that will typically be used for enhanced oil recovery or disposal.

Acquire and Analyze Brackish Groundwater Data

Issue. Even as RWPGs are increasingly turning to brackish groundwater to address their projected water shortages, implementing specific desalination projects is becoming a challenge, both in terms of money and knowledge about the aquifers. One of the main reasons for this is lack of detailed information about the resource. Thus, before the full potential of brackish groundwater desalination in the state can be realized, it is vital that the resource be adequately characterized.

Recommendation. Provide funding to the TWDB for 2.5 FTEs and \$500,000 in appropriations to acquire and analyze brackish groundwater data and assess groundwater modeling techniques to predict brackish aquifer performance.

Background. Desalination of brackish groundwater is gaining importance as a water management strategy in the regional water planning process. In the 2002 State Water Plan, three RWPGs recommended brackish groundwater desalination for a total of about 96,000 acre-feet per year by the year 2050. Five years later, in the 2007 State Water Plan, both the number of regions recommending the strategy and the projected volume of desalinated water had doubled to six regions and about 175,000 acre-feet.

In 2005, the 79th Texas Legislature considered and approved \$3.3 million to continue and expand the state's efforts at developing new water supplies through water desalination. The appropriation included \$200,000 for staff costs to oversee the projects, monitor the development of desalination technology, and provide educational outreach and technology transfer. In

2007, the legislature included \$600,000 for grants for brackish groundwater desalination demonstration projects.

These appropriations have funded seven brackish groundwater desalination demonstration projects and two seawater desalination pilot plant studies. The goal of the brackish groundwater desalination demonstration projects is to facilitate the development of brackish groundwater by creating replicable models of projects that may be effectively transferred to other communities with similar profiles. If successful, these projects can be used by other communities as engineering facility roadmaps to characterize source waters, implement desalination technologies, and manage desalination concentrate.

To date, TWDB has awarded \$1,469,000 in grants for the seven brackish groundwater desalination projects, leveraging \$8,783,010 in commitments from the grantees for a total of \$10,252,010 in project costs.

A 2003 study conducted for TWDB laid the foundation for estimating brackish groundwater volumes in the aquifers on a statewide basis. Important as this study was in bringing to prominence the enormous volume of brackish groundwater available in the state, it was by design regional in scope, limited in areal extent (to aquifer boundaries delineated by TWDB), and narrow in its assessment of groundwater quality (TDS). The information was developed primarily to assist RWPGs assess brackish groundwater as a water management strategy. Consequently, the data gathered for the study were not at the level of detail needed for engineering facility planning purposes.

TWDB proposes to build on and add to the 2003 LBG-Guyton work through volumetric assessment, water quality assessment, and aquifer productivity assessment of brackish groundwater resources. Furthermore, TWDB proposes a pilot program extending over a period of four years that will focus on three areas of the state: Winkler County in Region F (the Capitan Reef aquifer); Hidalgo County in Region M (the Gulf Coast aquifer); and Lubbock County in Region O (the Edwards-Trinity High Plains aquifer) where the 2006 regional water plans have recommended brackish groundwater desalination as a water management strategy to meet water needs within the next 10 years. It should be noted that the aquifers and counties are identified in the 2006 regional water plans for the brackish groundwater desalination strategy and that the pilot program will be limited to and conducted on a county-wide scale. Eventually, the work will be extended to all the major and minor aquifers in the state and to other geological formations that may contain brackish water.

About the TGPC

Groundwater is vital to the future of Texas. In 2003, Texans used about 16 million acre-feet of water, of which 9.3 million acre-feet was groundwater,¹ or 57 percent of all water used. Approximately 79 percent of groundwater is used for irrigation, with the remainder used for municipal, rural and domestic consumption, livestock, electric utility, and industry. In 2003, approximately 36 percent of municipal water in Texas was obtained from groundwater sources.

Major and minor aquifers underlie approximately 76 percent of the state's 266,807 square mile surface area. Major aquifers are defined as producing large quantities of water in a comparatively large area of the state, whereas minor aquifers produce significant quantities of water within smaller geographic areas or small quantities in large geographic areas. Minor aquifers are important because they may constitute the only significant source of water in some regions. The TWDB has delineated nine major aquifers and 21 minor aquifers. Current maps of the aquifers are available on the TWDB's web site at www.twdb.state.tx.us/mapping/index.asp.

In some areas of the state, "undifferentiated" local aquifers may represent the only source of groundwater where major or minor aquifers are absent. These local aquifers vary in extent from being very small to encompassing several hundred square miles.

Because of the importance of groundwater resources in the state, the Legislature created the TGPC in 1989 to bridge gaps and improve coordination among existing state water and waste regulatory programs. [State law TWC, 26.401-26.407] established the TGPC and outlined its powers, duties, and responsibilities.

Creation and Mandate

The Legislature established a policy of nondegradation of the state's groundwater resources as the goal for all state programs. The state's groundwater protection policy recognizes:

- the variability of the state's aquifers in their potential for beneficial use and susceptibility to contamination;
- the value of protecting and maintaining present and potentially usable groundwater supplies;
- the need for keeping present and potential groundwater supplies reasonably free of contaminants for the protection of the environment and public health and welfare; and

¹An acre-foot is 325,851 gallons and would cover one acre a foot deep.

- the importance of existing and potential uses of groundwater supplies to the economic health of the state.

The state's groundwater protection policy provides that discharges of pollutants, disposal of wastes, and other regulated activities be conducted in a manner that will maintain current uses and not impair potential future uses of groundwater or pose a public health hazard. The use of best professional judgment by the responsible state agencies in attaining the goal and policy is also recognized.

The TGPC implements this policy by identifying opportunities to improve existing groundwater quality programs and promote coordination among agencies. The TGPC identifies areas where new or existing programs can be enhanced to provide additional protection. The major responsibilities of the TGPC are:

- improve coordination among member agencies and organizations engaged in groundwater protection activities;
- develop, implement, and update a comprehensive groundwater protection strategy for the state;
- study and recommend to the Legislature groundwater protection programs for each area in which groundwater is not protected by current regulation;
- file with the Governor, Lieutenant Governor, and Speaker of the House of Representatives a biennial report of the TGPC's activities and any recommendations for legislation for groundwater protection;
- publish an annual groundwater monitoring and contamination report describing the current monitoring programs of each member agency and the status of groundwater contamination cases documented or under enforcement during the calendar year; and
- advise the TCEQ on the development of plans for the protection and enhancement of groundwater quality pursuant to federal statute, regulation, or policy, including management plans for the prevention of water pollution by agriculture chemicals and agents.

TGPC Member Programs

State law designated the TCEQ as the lead agency, with the Executive Director designated as the TGPC's chairman. The Executive Administrator of the TWDB is designated as the TGPC's vice chairman. Members of the TGPC are:

- Executive Director of the Texas Commission on Environmental Quality;
- Executive Administrator of the Texas Water Development Board;
- Executive Director of the Railroad Commission of Texas;

- Commissioner of Health of the Department of State Health Services;
- Deputy Commissioner of the Texas Department of Agriculture;
- Executive Director of the Texas State Soil and Water Conservation Board;
- Representative selected by the Texas Alliance of Groundwater Districts;
- Director of Texas AgriLife Research;
- Director of the Bureau of Economic Geology of the University of Texas at Austin; and
- Representative of the Water Well Drillers and Water Well Pump Installers program at the TDLR

All members may designate a representative to the TGPC. The current members and their designated representative are listed in Appendix 1.

The TCEQ, through the administration of the majority of the State's environmental and water quality regulatory programs, is primarily responsible for protecting groundwater quality. In addition, groundwater quality regulatory programs exist at: the Railroad Commission of Texas (oil and gas production and surface mining); the Texas Department of Agriculture (pesticide use); the Department of State Health Services (water resource protection); the Texas State Soil and Water Conservation Board (agricultural and silvicultural NPS pollution); and the TDLR (water well construction).

The TWDB collects and maintains water resource information; conducts statewide water planning; and administers financial assistance programs for water supply, water quality, flood control, and agricultural water conservation projects. The TAGD, as a non-governmental organization, has no regulatory or enforcement authority. However, GCDs that participate in TAGD have authority over groundwater use and contamination. Texas AgriLife Research and the BEG conduct research activities related to groundwater protection.

Texas Commission on Environmental Quality. The TCEQ has the responsibility for the majority of the state's environmental and water quality regulatory programs. The TCEQ conducts a variety of programs that address groundwater protection and focus on both prevention of contamination and remediation of existing problems. The TCEQ implements these programs through education, voluntary action assistance, permitting, and enforcement.

As the state lead agency for water quality and environmental protection, the TCEQ administers both state and federally mandated programs. Federal programs include:

- the Resource Conservation and Recovery Act for the management of municipal and industrial wastes;
- the Comprehensive Environmental Response, Compensation, and Liability Act or Superfund environmental cleanup program;
- the Clean Water Act for managing pollutant releases to state waters;
- the Safe Drinking Water Act for the protection of public drinking water supplies; and
- the development of pesticide management plans (PMP) for the protection of groundwater under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

The TCEQ has responsibilities and authorities under state law provided in the TWC and the Texas Health and Safety Code for a number of programs addressing water resource management, waste management, and environmental protection.

The TCEQ is headed by a three-member commission and organized into major functional program areas. The Office of Permitting and Registration is responsible for permitting facility operations that include provisions to prevent groundwater impacts, and for providing support to the TGPC. The Office of Compliance and Enforcement is responsible for assuring that regulated entities comply with permits and agency rules including provisions related to groundwater quality protection through a network of agency regional offices, facility inspections, enforcement proceedings, professional licensing; for remediation and corrective action to address groundwater contamination; and implementation of the Edwards Aquifer Protection Program. The Chief Engineer's Office is responsible for developing and implementing plans for achieving clean water. Programs throughout the TCEQ provide outreach and technical assistance to specific stakeholders and regulated communities. The TCEQ also has outreach programs designed to help small businesses and local governments.

Texas Water Development Board. The TWDB, created in 1957, is the state agency responsible for collection and maintenance of water resource information; statewide water planning; and administration of financial assistance programs for water supply, water quality, flood control, and agricultural water conservation projects. The TWDB is responsible for the development of the state water plan to provide for the orderly development, management, and conservation of the state's water resources. The TWDB provides support to RWPG for the development of regional water plans that are used to prepare the state water plan.

The TWDB, in support of its water planning and data collection responsibilities, conducts an active groundwater resource

assessment program. The TWDB conducts studies to assess the state's aquifers, including occurrence, availability, quality, and quantity of groundwater present. It also identifies major groundwater-using entities and current and projected demands on groundwater resources. The TWDB conducts statewide groundwater level measuring and groundwater quality sampling programs as a part of its assessment effort. The groundwater quality-sampling program permits the TWDB to: (1) monitor changes, if any, in the ambient quality of groundwater over time, and (2) establish the baseline quality of groundwater occurring naturally in the state's aquifers.

As a significant part of the water planning process, the TWDB supports the development of GAMs which are state-of-the-art, publicly available numerical groundwater flow models. GAMs are tools to help in the process of determining groundwater availability in Texas in order to ensure adequacy of supplies or recognition of inadequacy of supplies throughout the state water plan's 50-year planning horizon. The TWDB has 20 models covering all nine of the state's major aquifers and several of the minor aquifers, and is now working on developing 12 additional models for the remaining minor aquifers as well as updating existing models to include new aquifer and water use information.

Railroad Commission of Texas. The Railroad Commission of Texas' (RCT) regulatory authority includes oil and gas exploration and production, surface mining and mine reclamation, and pipelines. Oil and gas related environmental regulations under the RCT include well drilling and completion; well plugging; surface storage, treatment, and disposal of oil and gas wastes; oil spill response; management of hazardous oil and gas wastes; disposal of non hazardous oil and gas wastes by injection; underground injection of fluids for enhanced recovery of hydrocarbons; underground hydrocarbon storage; solution mining of brine; and remediation associated with the aforementioned activities. The RCT also offers technical guidance through its oil and gas waste minimization program. Environmental activities related to surface mining include surface coal and uranium mine operations, and mine land abandonment. Pipeline regulations primarily are safety regulations, although the routes of new pipelines are reviewed for environmental risk.

Permits to drill oil, gas, and related wells are issued only after the applicant has submitted a letter from the TCEQ that provides information on the depth of usable quality groundwater. The information is used to ensure that the well is constructed and cemented in a manner that protects groundwater. Similarly, the information is used to ensure that plugs are set to isolate and protect groundwater during plugging operations. Knowledge of

the presence of shallow groundwater and the recharge areas of aquifers is vital to the regulation of surface storage and disposal of oil and gas wastes. Underground injection including hydrocarbon storage, and brine mining, are primarily groundwater protection regulations federally delegated under the Safe Drinking Water Act. The RCT requires remediation of sites contaminated by oil and gas exploration, production, disposal, and pipeline operations to prevent groundwater contamination or to mitigate groundwater contamination. Remediation projects include operator-initiated cleanup and state-funded cleanup, if no responsible party exists. Oil spills must be reported, managed and remediated in accordance with state regulations.

The Site Remediation Section of the RCT is responsible for the state funded cleanup of abandoned oil field pollution sites (State-Funded Cleanup Program) and the oversight and monitoring of complex pollution cleanups conducted by responsible operators (Operator Cleanup Program). In addition, the Site Remediation Section administers a Voluntary Cleanup Program, which is an incentive program for remediation of contaminated property under the RCT's jurisdiction by persons not responsible for the contamination. The goal of these programs is to control or cleanup oil and gas waste or other materials that are causing or likely to cause the pollution of surface or subsurface water, to ensure human health and safety and to protect the environment.

A groundwater impact assessment is performed as part of the surface mining permitting process. Permits contain plans to protect the groundwater resources in the area of the permit. Groundwater may be removed during the mining activities; however, if those activities adversely impact a currently used groundwater resource, then the impacts must be mitigated. Abandoned mines are closed to protect natural resources and the public.

Texas Department of Agriculture. The Texas Department of Agriculture (TDA) has lead authority for pesticide regulation in Texas. The TDA recognizes certain pesticides as potential groundwater contaminants and has a primary responsibility in preventing unreasonable risk to human health and the environment from the use of pesticides. The agency conducts a variety of activities designed to reduce the potential of groundwater contamination by pesticides:

- All pesticide products sold and used in Texas must be registered with the TDA. This process ensures these products have met all EPA requirements for use.
- The agency has responsibility and authority under the Texas Agricultural Code to enforce pesticide labels, which include directions and precautions that directly or indirectly reduce the potential of groundwater contamination.

- All prospective users of restricted-use or state-limited-use pesticides are required to obtain an applicator's license. This process includes training in the proper and legal use of pesticides, applicator testing, and continuing education.
- The TDA maintains a program to assess the potential impacts of agricultural chemicals on human health and the environment, including groundwater quality.
- The TCEQ and the TDA serve as co-chair of the PMP Task Force, under the authority of the TGPC. Staff participates on several interagency subcommittees and task forces charged with conducting various aspects of the State's generic PMP. The Pesticide Division also directs other pesticide-related water quality issues.

These activities are conducted to ensure compliance with federal and state laws and regulations relating to the use of pesticides and the protection of groundwater resources. In addition, the TDA also provides support and assistance in state environmental projects where agricultural pesticide use and regulation are of concern.

The TDA does not routinely conduct groundwater monitoring for pesticides. The agency relies on monitoring data generated by the TCEQ and the TWDB to identify sites of concern. In addition, monitoring data of federal, local, and private entities are also evaluated when available. At that point, the TDA may address the situation through any or all of its regulatory activities as well as coordinate prevention efforts with other government, educational, and/or private entities.

Department of State Health Services. The Department of State Health Services (DSHS), formerly the Texas Department of Health, has limited involvement in groundwater protection, although it does provide services that are related to groundwater safety and public health concerns. With regard to groundwater issues, the Community Hygiene Group in the Division of Regulatory Services acts primarily in a nonregulatory manner and serves in an advisory or public service role. When public health is impacted by groundwater contamination, the agency's response would focus on providing advice and assistance to the population affected. Since the DSHS' involvement in groundwater issues is primarily advisory, the agency assists in determining the problem and providing help to the affected public. Regulatory aspects and remediation requirements are the responsibility of other state and federal agencies, as appropriate.

Although there are no direct programs that relate to groundwater protection, the DSHS does have programs that indirectly provide protection to the state's water resources. Under the Regulatory Licensing Unit, the Chemical Reporting Group administers and enforces Tier II reporting of hazardous substances. The Policy

Standards and Quality Assurance Unit oversees programs for youth camps, childcare centers and investigates public health nuisance complaints.

The DSHS Laboratory Services Section performs chemical and microbiological analyses for any program at DSHS that needs water quality testing for its samples. For example, the laboratory routinely performs polychlorinated biphenyl (PCB) analyses of surface and groundwater samples for the federal PCB program. The Laboratory Services Section also accepts water samples for routine microbiological analysis from the public for a fee and works under contract with other state agencies such as the TCEQ.

Texas State Soil and Water Conservation Board. The TSSWCB was created in 1939 by the Texas Legislature to organize the state into SWCD and to serve as a centralized agency for communicating with other state and federal entities as well as the Texas Legislature. Headquartered in Temple, Texas, the TSSWCB offers technical assistance to the state's 217 SWCDs and maintains regional offices in strategic locations in the state to help carry out the agency's water quality responsibilities. The TSSWCB is governed by a seven-member board composed of two Governor appointees and five landowners elected throughout Texas by more than 1,000 SWCD directors.

The TSSWCB is the lead agency for the planning, management and abatement of agricultural and silvicultural NPS pollution, and administers the Texas Brush Control Program. The TSSWCB has no statutory authority in the area of point source pollution, including misuse or accidents involving agricultural chemicals that are defined as point source pollution. The Board cooperates with the TDA and TCEQ in instances of point source agricultural chemical pollution. The TSSWCB also works with other state and federal agencies on NPS issues as they relate to Water Quality Standards and Criteria, Total Maximum Daily Loads, and Coastal Zone Protection. The TSSWCB works to ensure SWCDs and local landowners are adequately represented in these matters that could have a significant impact on future conservation and utilization of natural resources.

The TSSWCB has authority to establish water quality management plans in areas that have developed, or have the potential to develop, agricultural or silvicultural NPS water quality problems. This program provides, through local SWCDs, development, supervision and monitoring of individual water quality management plans for agricultural and silvicultural lands.

Besides their involvement in the abatement of NPS pollution, the Board also helps to preserve groundwater resources with its Cost Share Program and Brush Control Program. The Cost Share Program funds up to 75 percent of the implementation costs for a

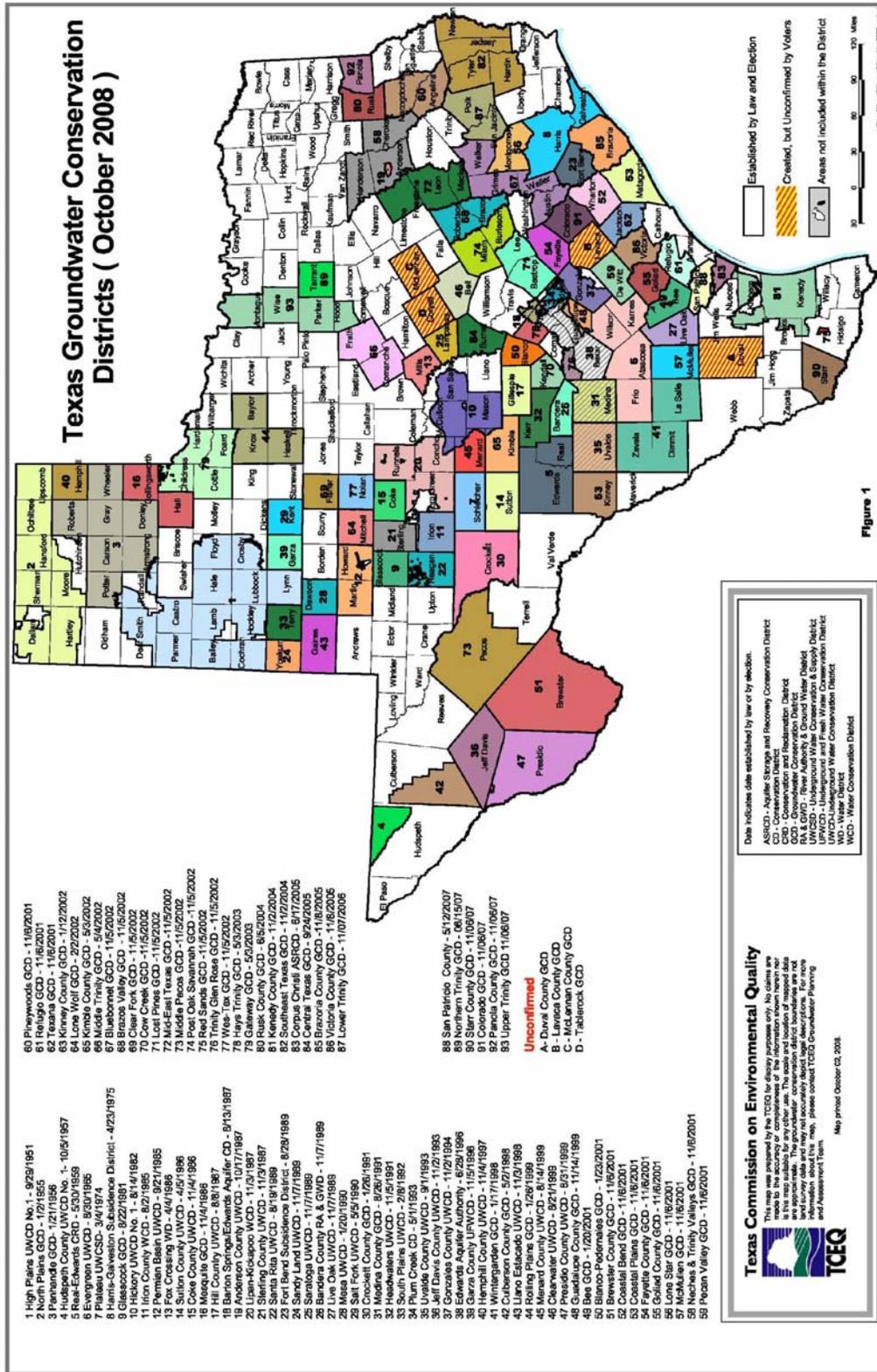
Water Quality Management Plan, which is developed and approved by the Board. This plan represents a commitment by the landowner to use the BMPs, as laid out in the plan, in order to protect their land and water resources from erosion, pesticide contamination, and overuse of the land. The Brush Control Program also protects groundwater resources by controlling invasive brush species that use large amounts of water. By controlling the brush in an area and restoring the native grasses, more water is available to recharge the underlying aquifer.

Texas Alliance of Groundwater Districts. The TAGD, formerly the Texas Groundwater Conservation Districts Alliance, was formed on May 12, 1988. Its membership is limited to GCDs in Texas provided their powers and duties allow the district to manage groundwater as expressed in TWC, Chapter 35 and Chapter 36. TAGD is organized exclusively for charitable, educational, or scientific purposes within the meaning of Section 501(c)(3) of the Internal Revenue Code.

The TAGD was formed to further the purposes of groundwater conservation and protection activities. The TAGD provides a means of communication and exchange of information among individual GCDs on issues ranging from the day-to-day operation of local groundwater management to statewide groundwater resource policy issues. Members of the TAGD are part of a network in which valuable technical and operational experience is available to members and the interested public. The TAGD maintains contact with members of the private sector and various elected, local, state, and federal officials, providing them with timely information on activities and issues relevant to groundwater management. Members of the TAGD also serve on various local, state, and federal agency committees and subcommittees, providing input and information on behalf of member districts. To date, there are 80 district members of the TAGD. A listing of all GCDs is depicted in Figure 1.

Texas AgriLife Research. The Texas AgriLife Research is the official agricultural research agency in Texas. AgriLife Research has no regulatory authority. Headquartered at Texas A&M University, AgriLife Research promotes food and fiber production while emphasizing water conservation and the protection of natural resources. AgriLife Research operates a system of 14 research centers that are located in the major land and natural resource regions of Texas. TWRI is an administrative unit of Texas AgriLife Research with partial funding through the USGS and has responsibilities for fostering research and educational programs dealing with water issues statewide.

Broad goals of the AgriLife groundwater research program are to protect, preserve, and efficiently use water resources, and to develop sustainable agricultural production systems. Groundwater



programs of AgriLife Research stress the development of management strategies, technologies, and educational programs to support sustainable agriculture. AgriLife groundwater quality research focuses on reductions in chemical use; the control, fate, and transport of agricultural chemicals; and the remediation of contaminated groundwater.

Major efforts are under way to develop strategies to manage brush species on rangelands to increase water yields and protect water quality; to manage solid and liquid wastes from livestock production and processing to prevent water contamination; to develop crop production technologies that produce high yields while minimizing the loss of pesticides, chemicals and nutrients into ground and surface waters; and, to manage contaminants produced during industrial and urban activities.

Texas AgriLife Research trains future professionals through undergraduate and graduate education and research programs at Texas A&M University and other System institutions. Many AgriLife researchers at Texas A&M University in College Station hold teaching appointments, thus providing the latest research results to students.

AgriLife Research efforts are complemented by the programs of the Texas AgriLife Extension Service, also a component of the Texas A&M University System. AgriLife Extension conducts educational programs on management strategies and BMPs to protect groundwater resources. AgriLife Extension specialists produce easy-to-read fact sheets and other publications for specific clientele, including agricultural producers. Other activities include field demonstrations and educational programs youth and adults. Texas AgriLife Extension Service has no regulatory authority.

Bureau of Economic Geology. The BEG, established in 1909, is a research entity of The University of Texas at Austin and functions as the State Geological Survey. The BEG is one of three member institutions within the Jackson School of Geosciences. One of the goals of the Jackson School is to conduct research related to water issues in Texas with some internal funding for these programs. The BEG conducts basic and applied research projects related to water resources and contaminant transport in support of other state and Federal agencies. The BEG is not a regulatory agency and has no groundwater protection regulatory programs but supports the agencies that fulfill these functions.

The BEG serves as a valuable resource for geologic maps and reports that provide the framework for many environmental studies. The state geological mapping program focuses on developing maps of different geologic units and works with other state agencies to identify priority areas related to environmental issues. The core repository at the BEG contains an extensive collection

of cores from many of the geologic units in the state. One of the strengths of environmental studies conducted by the BEG is the integration of geology and hydrology.

Groundwater resources are the focus of several studies conducted by the BEG. Groundwater models have been developed by BEG scientists of many of the major aquifers in the state, including the northern Ogallala, Trinity, Carrizo-Wilcox, Edwards (Barton Springs segment), and Gulf Coast aquifers as part of the TWDB Groundwater Availability Model Program.

The BEG also has unique capabilities in unsaturated zone hydrology including physical, chemical, and isotopic analysis and modeling. The unsaturated zone is extremely important because many contaminants originate near the land surface and have to be transported through the unsaturated zone to reach the water table. In addition, groundwater recharge generally occurs through the unsaturated zone and is a critical issue for assessing groundwater availability in the state. Examples of previous studies in unsaturated zone hydrology include characterization of water fluxes related to proposed low-level radioactive waste disposal sites, quantification of contaminant transport related to the U.S. Department of Energy's Pantex Plant, and estimation of recharge for groundwater modeling studies and for aquifer vulnerability to contamination.

The BEG has conducted many studies evaluating contaminant transport in the state. Examples of the types of studies include evaluation of sources of nitrate contamination in major aquifers for the TCEQ, delineation of salinity contamination related to oil and gas production activities for the RCT, assessment of transport processes at the Department of Energy's Pantex Plant, and evaluation of benzene plumes related to underground fuel tanks. Results of the benzene plume study were extremely valuable for the TCEQ in developing remediation protocols with respect to leaking petroleum storage tanks.

One of the missions of the BEG is public outreach. In its role as the State Geological Survey, the BEG responds to questions and requests for information from other institutions and the public. The BEG participates in many public education programs, including efforts to engage kindergarten through 12th-grade students and teachers in scientific discovery. The BEG has been actively involved in organizing and promoting Earth Science Week, celebrated both nationally and internationally, which highlights the ways the earth sciences affect our daily lives and features an annual career fair.

Texas Department of Licensing and Regulation. The TDLR Water Well Driller/Pump Installer/Abandoned Well Program (WWD/PI/ABW Program) maintains the Water Well Drillers Advisory Council; investigates all alleged violations of Chapters

1901 and 1902 of the Texas Occupations Code and 16 TAC Chapter 76 (Water Well Drillers and Pump Installers Rules); investigates consumer complaints filed against regulated well drillers/pump installers; and randomly inspects wells to insure compliance with well construction standards. Investigations also include compliance with rules requiring isolation of zones containing undesirable or poor quality water to prevent commingling with and degradation of fresh water zones. Investigations that involve groundwater contamination are referred to the appropriate state agency with jurisdiction for the activity believed to be the cause of the contamination. In an area where groundwater contamination has been confirmed, the WWD/PI/ABW Program notifies licensees of the contamination by letter, including instructions on how to complete wells in the area to avoid further contamination. The WWD/PI/ABW Program also works with federal, numerous state and local entities in the area of groundwater protection.

The WWD/PI/ABW Program administers the Abandoned Well Notification and Enforcement Program. The Program has created a web site where abandoned or deteriorated wells can be reported online. A person can file a complaint about an abandoned well and track the status of the complaint. Abandoned or deteriorated wells are reported to the TDLR by drillers, pump installers, and neighbors who discover them. The WWD/PI/ABW Program contacts the landowners by letter to notify them of the requirement to plug or bring the wells into compliance no later than 180 days from the time of the notice. Only licensed water well drillers, licensed pump installers, or the landowner whose property contains an abandoned or deteriorated well may plug or bring the well into compliance. A State of Texas Plugging Report must be submitted to the TDLR no later than 30 days after the well is plugged or capped. Information is available, from the TDLR and the TGPC, to landowners wishing to plug their own wells. In addition, a joint memo of understanding has been developed to coordinate the efforts of the TDLR, the field offices of the TCEQ, and GCDs, relating to investigative procedures for referrals of complaints regarding abandoned and/or deteriorated wells.

TGPC Activities 2007-2008 Biennium

The TGPC implements and coordinates projects and administrative requirements by subject area. The following section describes TGPC efforts. In general, TGPC activities are a result of four interrelated requirements. They are:

- state laws specific to TGPC functions;
- state requirements of TGPC member agencies and organizations;

- federal law; and
- the *Texas Groundwater Protection Strategy*.

In order to highlight the links between the *Strategy* implementation and other TGPC activities, relevant *Strategy* recommendations are featured in text boxes.

The following sections discuss the TGPC activities by subject area. These include:

- Implementation of the objectives found in the *Strategy*;
- Agricultural Chemical Activities;
- Groundwater Data Management Activities;
- Nonpoint Source Pollution Activities;
- Public Outreach and Education Activities;
- Groundwater Research Activities;
- Intergovernmental Cooperation Activities; and
- TGPC Administrative Activities.

Implementation of the Texas Groundwater Protection Strategy

Background

The Legislature charged the TGPC with developing and updating a comprehensive groundwater protection strategy for the state that includes guidelines for the prevention of contamination and for the conservation of groundwater, and provides for the coordination of the groundwater protection activities of the agencies represented on the TGPC.

With the continuing state focus on the need for assuring a high quality supply of groundwater, and recognizing the programmatic changes that have occurred since the state's first groundwater protection strategy was developed in 1988, the TGPC decided in January 2001 to update the state's groundwater strategy. The TGPC issued the revised *Strategy* in February 2003.

Overview of the *Groundwater Protection Strategy*

In developing the *Strategy*, the TGPC recognized that the state has numerous successful groundwater programs spread among local and state governmental agencies and research institutions. Therefore, a key part of the *Strategy* documented how the current regulatory, outreach, and research programs work to protect groundwater resources. A second component of the *Strategy* was the identification of protection gaps in program implementation

or coordination. TGPC believes that the *Strategy*, grounded firmly within the existing policy and programmatic directions given by the Legislature, resulted in a document that sets realistic objectives for success and provides a road map for action over the next five to fifteen years. A detailed discussion of the *Strategy* can be found in Appendix 2.

The *Strategy*:

- details the state's groundwater protection goal as established by the Legislature;
- explains the state's efforts to characterize the occurrence, quality, and quantity of groundwater resources and discusses various assessment approaches used in program implementation;
- describes the roles and responsibilities of the various state agencies involved in groundwater protection and discusses the TGPC as a coordinating mechanism;
- provides examples of how the various state agencies implement groundwater protection programs through regulatory and non-regulatory models;
- explains how local, state, and federal agencies coordinate management of groundwater data for the enhancement of groundwater protection;
- discusses the role that research plays in understanding groundwater's importance and the importance of coordinating research efforts;
- provides an overview of groundwater public education efforts in the state;
- discusses public participation in establishing and implementing groundwater policy;
- lays out a planning process for updating the *Strategy*;
- proposes for inclusion in the next *Strategy* an identification and ranking of significant threats to the state's groundwater resources, consideration of the vulnerability of groundwater resources to such threats, and a prioritization of actions to address those threats; and
- provides recommendations and possible actions to protect groundwater.

Summary of *Strategy* Recommendations

Strengthen Communication with the State's Water Planning Efforts.

- The TGPC needs to strengthen the lines of communication and information sharing with the State's RWPG. The lack of communication between these two programs is a gap in the TGPC's ability to

coordinate the state's groundwater protection strategy with the state's water supply planning efforts led by the TWDB.

Improve Groundwater Data.

- The existing groundwater quality monitoring programs need more resources to sample additional sites that will provide a better picture of groundwater conditions statewide.
- The parameters that are analyzed need to be expanded to include organic and synthetic chemicals. While site-specific assessment of hazardous wastes in groundwater is covered by a number of state and federal programs, other substances in groundwater, such as nitrate and arsenic that may be deemed naturally occurring, need better assessment.
- The TGPC should develop recommendations on the design of a groundwater monitoring system that will meet the needs of all member agencies and organizations. Any new monitoring of domestic water wells would be on a voluntary basis.
- Data management standards should be periodically reviewed and amended to facilitate information exchange. The TGPC must review and revise its groundwater data management standards and guidelines, and must actively participate in the various data management advisory groups.
- All available data sources should be checked for validity via accepted quality assurance and quality control measures, and once accepted, placed into an electronic format with a spatial data element for indexing in a relational database. The location and geometry of contamination plumes should be placed in a Geographic Information System (GIS) format.
- There is a large number of existing hard-copy water well drillers reports that need to be placed in a digital format and made accessible through the existing digital system.

Coordinate Research.

- The TGPC should form a research subcommittee to identify inter-agency research needs and to provide a coordinated approach for discussion with federal agencies for funding. The results of this work should be shared with the TCEQ for its consideration under the research model authorized under state law.

Increase Public Outreach.

- More water quality information is needed to develop assessments of water quality and health risk for the domestic/private well owner segment of the population.
- The state should undertake a voluntary program targeted at private well owners, designed to identify problem areas and assist private well owners in understanding these groundwater quality issues.

- More support needs to be given to educational efforts for targeted geographic areas of concern for high concentrations of naturally occurring groundwater contaminants and on various treatment options available to the domestic/private well owner.
- Support is also needed for educational efforts to develop and deliver effective educational materials that target potential sources of contamination such as abandoned wells.
- Special effort should be made to develop educational programs designed to reach and serve the state's high-growth areas.
- The TGPC recommends that the state continue to support the efforts of the On-Site wastewater Treatment Research Council, the Texas AgriLife Extension Service, the TCEQ's on-site wastewater program, and local governments in their efforts to develop and deliver effective educational material that addresses on-site sewage facility (OSSF) maintenance in order to prevent failures.
- Government agencies involved in OSSF regulation and outreach may want to consider developing programs specially designed to reach and serve the state's high growth counties.
- The TGPC should establish, on its web site, links to key groundwater information residing at state agencies and educational institutions.

Commit to Development of Periodic Updates and Improvements to the State Groundwater Protection Strategy.

- The TGPC should update the *Strategy* every 6 years.
- The TGPC should conduct an analysis that will identify and rank threats to groundwater quality (taking into consideration the vulnerability of groundwater resources and using available data), and prioritize possible actions that address those threats.

Agricultural Chemicals Activities

TWC, 26.407 requires the TCEQ to develop any necessary management plans for agricultural chemicals, with the advice of the TGPC. These plans will address agricultural chemicals such as pesticides that may threaten groundwater quality.

Specifically, these plans are to be developed for the protection and enhancement of water quality pursuant to federal statute, regulation, or policy, and include management plans for the prevention of water pollution by agricultural chemicals and agents. These management plans were initially referred to as State Management Plans or SMPs, but more recently are referred to as Pesticide Management Plans or PMPs.

Pursuant to a EPA proposed rule and policy the TCEQ with participation from the TGPC, in 2001, developed the *Texas State Management Plan for Prevention of Pesticide Contamination of Groundwater*. This plan, as a generic PMP for the state, serves as

a guide for the prevention of pesticide contamination of groundwater. The plan was developed as a joint effort of the agency members of the ACS. A more detailed discussion of the PMP can be found in Appendix 3.

The PMP explains the general policies and regulatory and non-regulatory approaches the state will use to protect groundwater resources from contamination by pesticides. The document explains a generic coordinating mechanism among all responsible and participating agencies during the implementation of the PMP and provides for specific responses when it is deemed necessary to take actions to protect groundwater. The PMP reflects the state's philosophy toward groundwater protection and recognizes the importance of agriculture to the state's economy.

Ultimately EPA did not adopt the proposed rule mentioned above but instead evolved its policy with regard to agricultural chemicals. Starting in FY 2007 EPA moved to a new strategy which consists of a process whereby the states are encouraged to develop a list of pesticides of interest (POIs), from which, after an assessment process, a list of pesticides of concern (POCs) will be selected. Also, the new EPA strategy has been extended to include surface water concerns as well as groundwater. However, even though the POIs and POCs selected will take into consideration the potential pollution of both groundwater and surface water, groundwater will continue to be the focus of the PMP. Reliance will be placed on the appropriate sources for pesticide surface water data. POCs are to be assessed further, and if necessary managed through the Pesticide Management Process outlined in the PMP that was developed under EPA's earlier strategy.

Much of the TGPC's work on agricultural chemicals follows the PMP and is performed by the ACS. The ACS has designated five task forces through which it carries out its work:

- The PMP Task Force formerly the SMP Task Force has been charged to revise the PMP and to develop the lists of POIs and POCs.
- The Education Task Force develops PMP-related educational information and materials and coordinates educational outreach including public presentations, displays, applicator certification curriculum development, and brochures.
- The Site Selection Task Force conducts reviews of pesticide-specific groundwater monitoring and investigation strategies for determining the extent of contamination.
- The Data Evaluation and Interpretation Task Force reviews the available information to determine the probable source and cause of the contamination. If monitoring reveals contamination the Task Force coordinates the state's response under the PMP.

- The BMP Task Force is responsible for developing the preventive component of the generic PMP and identifying pesticide-specific and area-specific BMPs that can be used to prevent or curtail pesticide contamination of groundwater.

Currently, the ACS is working on four areas of the PMP: (1) continued cooperative monitoring, (2) responding to confirmed cases of pesticide contamination of groundwater, (3) identifying and providing outreach on BMPs in problem areas, and (4) monitoring for urban pesticides. These efforts are discussed in detail in Appendix 3.

Monitoring efforts have been significantly enhanced through a cooperative sampling effort among the TWDB, a number of GCDs, and the TCEQ. During the most recent round of cooperative monitoring, 191 samples were taken in 2007, and up through July, 202 samples in 2008. Monitoring continues to indicate atrazine detections in the central Panhandle of Texas but only occasional low-level detections of atrazine or metolachlor in the rest of the state. All but one of the cooperative monitoring detections has been significantly below the maximum contaminant level (MCL) for drinking water. Because of the rarity of metolachlor detects, monitoring for this pesticide has been discontinued.

Investigative and follow-up monitoring efforts have been conducted at five sites in the central Panhandle. These activities continued throughout the biennium to track and to address atrazine detections in public water supply (PWS) wells. Monitoring reveals that atrazine concentrations have primarily decreased or remained the same over the past five years.

In response to low-level detections of the pesticide atrazine in groundwater in the Panhandle, the TGPC worked with the Texas AgriLife Extension Service staff in Lubbock to develop a “Best Management Practices Training and Curriculum Manual” in 2005. Presentations were given by the AgriLife Extension Service in 2005 and 2006, at eight separate events each year. The TDA also utilized some of this material to train their inspectors in 2008. The curriculum and training are a result of interagency coordination and cooperation in monitoring, education and outreach under the PMP. The TGPC worked with the AgriLife Extension Service staff through the POES to develop a BMPs for pesticides tri-fold brochure, and several FAQs that address much of the same subject matter in greater detail than the tri-fold in 2008.

During the biennium, TGPC continued to sponsor a table display in December at the annual Texas Plant Protection Conference explaining the PMP program in Texas through the distribution of brochures and the exposition of various pesticide groundwater monitoring graphics, including GIS maps of water wells

monitored for pesticides in Texas. A presentation on the assessment of pesticide occurrences in the state's major and minor aquifers was given at the TCEQ Environmental Trade Fair and Conference (ETF) in May 2007. A presentation on the protection of groundwater from pesticides in Texas, for the ACS, was given at the Texas Agricultural Aviation Association annual conference in January 2007. A presentation on the urban pesticide monitoring program was given at the TCEQ ETF in April 2008. These presentations are also a result of interagency coordination and cooperation in monitoring, education and outreach under the PMP.

The ACS held eight meetings during the biennium and is composed of interested TGPC member agencies and organizations.

Groundwater Data Management Activities

Sound management of groundwater data is essential to protecting water quality and ensuring adequate groundwater supplies. Because of the importance of scientifically sound data, the TGPC, its member organizations, the federal government, local governments, and regulated entities all place a great premium on ensuring its accuracy and availability. The TGPC uses the expertise of its members and other experts through the GDMS to address many of the recommendations found in the *Strategy*.

The TGPC also uses the GDMS to make available information on groundwater contamination and water-quality assessments of the state aquifers to the public through the publication of several reports mandated by both the state and the federal government. The subcommittee coordinates the compilation of data to be assessed by the TGPC and its member agencies and organizations to satisfy direct or indirect state and federal mandates such as the following reports:

- *Joint Groundwater Monitoring and Contamination Report (Joint Report)*—the GDMS compiles and advises the TGPC on possible improvements, and updates and revises the *Joint Report's* enforcement status matrix; and
- *Texas Water Quality Inventory Report [305(b) Report]*—The GDMS develops and implements a ten-year plan for the selection and subsequent annual assessment of the groundwater quality of the state's aquifers for inclusion in the federally required *305(b) Report*.

Joint Groundwater Monitoring and Contamination Report

The TGPC is required by TWC, 26.406 to publish an annual groundwater monitoring and contamination report. The report:

- describes the current status of groundwater monitoring activities conducted or required by each agency at regulated facilities or associated with regulated activities;
- contains a description of each case of groundwater contamination documented during the previous calendar year;
- provides a description of each case of contamination documented during previous periods for which enforcement action was incomplete at the time of issuance of the preceding report; and
- indicates the status of enforcement action for each case of contamination that is listed.

The TGPC produced and published two monitoring and contamination reports during the previous two years: *Joint Groundwater Monitoring and Contamination Report—2006* (TGPC, 2007) and *Joint Groundwater Monitoring and Contamination Report—2007* (TGPC, 2008) (*Joint Reports*). The findings are summarized below; however, a more detailed discussion of the *Joint Reports* and a summary of the report findings can be found in Appendix 4.

Data for the report comes from TGPC members and groundwater districts. Each member agency or organization provides the descriptions of their programs that protect groundwater. Each regulatory agency that requires or conducts groundwater monitoring to assure compliance with guidelines and regulations for the protection of groundwater from contaminants has its own monitoring program requirements and procedures.

The *Joint Report* for 2007 describes 17 regulatory monitoring programs in two state agencies. Monitoring of groundwater quality for permit and operational requirements occurred at approximately 11,000 facilities statewide. Data indicate that an estimated 56,238 monitor and water wells are being used for groundwater monitoring purposes at these facilities. The majority (greater than 99 percent) of the monitored facilities are under the jurisdiction of the TCEQ, with most of the remainder under the jurisdiction of the RCT.

The contamination cases identified in the *Joint Report* are primarily those where contaminants have been discharged to the surface, to the shallow subsurface, or directly to groundwater from activities such as the storage, processing, transport, or disposal of products or waste materials.

There were 5,576 documented groundwater contamination cases in the *Joint Report* for 2006 and 5,267 cases in 2007. Approximately 92.8 percent of the documented cases in 2007 were under the jurisdiction of the TCEQ. The remainder of the cases were under the jurisdiction of the RCT (with approximately 7.1 per-

cent); and GCDs which are members of TAGD (with 1 case, or less than 0.1 percent).

The most common contaminants reported in both 2006 and 2007 were gasoline, diesel fuel, and other petroleum products due to the large number of cases related to petroleum storage tank systems. Less common reported contaminants were organic compounds (such as phenol, trichloroethylene, carbon tetrachloride, dichloroethylene, and naphthalene), pesticides (such as alachlor, atrazine, bromacil, dicamba, and prometon), creosote constituents, solvents, heavy metals, and sodium chloride.

Groundwater Data Management

The GDMS facilitates much of the TGPC's interagency groundwater data communication to ensure that data is more accessible, usable, and valid. The subcommittee encourages uniform groundwater data management practices, the use of spatial data for GIS in groundwater quality/contamination studies, and promotes adherence to state guidelines and standards for data formats. The GDMS met formally three times during the biennium.

The subcommittee maintains and updates the *Texas Groundwater Data Dictionary*, first published in 1995, which serves as the standard reference for encouraging data uniformity. During FY 2005, the GDMS submitted this document to the Texas Geographic Information Council

Strategy Recommendation

The TGPC must review and revise its groundwater data management standards and participate in the various data management advisory groups.

(TGIC) for review of the spatial data elements for adequacy. TGIC reported that the spatial data elements in the dictionary

Strategy Recommendation:

All available data sources should be checked for validity via accepted quality assurance and quality control measures and, once accepted, placed into an electronic format with a spatial data element for indexing in a relational database. The location and geometry of contamination plumes should be placed in a GIS format.

met the state's requirement for minimum data elements and did not recommend any changes. Other data elements contained in the dictionary have been informally identified as potentially needing revision. The GDMS is currently working on the formal identification of any outdated data elements, and, based on the results of this identification, will determine whether a revision of the dictionary is necessary.

TGPC member agencies and organizations use the committee as the primary coordination mechanism for exchanging information

of various data collection and assessment initiatives. The development of spatial databases for groundwater contamination sites is an example of the type of initiative undertaken by member agencies and organizations. The TCEQ and the RCT are both working on spatial datasets for contamination sites under their individual jurisdictions.

Groundwater Monitoring Strategy

The GDMS has examined the data needs of the state's groundwater quality assessment programs, and is reviewing the adequacy of existing monitoring efforts in order to develop a comprehensive statewide

groundwater quality monitoring strategy. For a more detailed discussion of these efforts, see Appendix 2.

Gaps exist in the data collection and data assessment processes. The

existing groundwater quality monitoring program needs more resources to sample additional sites. The parameters that are analyzed need to be expanded to include organic and synthetic chemicals. Staff from member agencies and organizations worked on refining the first phase of a joint groundwater monitoring strategy. This monitoring strategy is intended to meet present and future needs for groundwater quality and quantity data. This first phase identifies a three-tiered monitoring concept that provides a foundation for building a more detailed monitoring program. The second phase of the monitoring strategy was completed in 2007, and refines the monitoring concepts, and proposes two assessment methodologies, one for data collected under the new monitoring strategy, and another for legacy data.

The development of this monitoring strategy is driven by both the *Strategy* and a need to improve the groundwater portion of the *305(b) Report*. Enhanced monitoring and a new assessment methodology for groundwater quality data will result in a more concise and usable version of the *305(b) Report* when submitted to EPA. While the current *305(b) Report* is prepared through inter-agency cooperation, primarily between the TWDB and the TCEQ, data gaps that were identified in the *Strategy* will be filled. Additionally, accurate reporting of specific, as opposed to generalized, groundwater quality issues will be possible.

The GDMS spent much of 2008 crafting a final groundwater monitoring strategy document for proposal to the committee. Still in draft form, the subcommittee is working out details on agency roles for the strategy, as well as identifying fiscal resources to implement the provisions of the strategy.

Strategy Recommendation:

The TGPC should develop recommendations on the design of a groundwater monitoring system that will meet the needs of all member agencies and organizations.

Nonpoint Source Pollution Activities

Formerly, NPS Pollution Activities of the committee were coordinated by the NPS Task Force, co-chaired by the TCEQ and the TSSWCB. During the biennium, the NPS Task Force was renamed as the NPS Management Plan Task Force. The NPS Management Plan Task Force will be deactivate and re-activated as needed (similar to the Legislative Report Subcommittee) in order to contribute to the NPS management plan that is published once every five years.

The charge of the NPS Management Plan Task Force was modified to reflect these changes. NPS Pollution was added to Item 5 of the TGPC quarterly meeting agenda (Information Exchange for Groundwater-Related Activities).

The Groundwater Research and POE Subcommittees were also charged with meeting annually with the TCEQ/TSSWCB NPS teams (possibly in the late spring or early summer) in order to share information, discuss NPS projects, and facilitate NPS grant proposals by TGPC member agencies. The TSSWCB representative to the committee was designated as a liaison to TCEQ/TSSWCB NPS teams. The NPS Management Plan Task Force is currently inactive.

Public Outreach and Education Activities

The TGPC Public Outreach and Education activities center on two overarching themes: (1) the protection of human health from contaminated groundwater or water that contains high levels of naturally occurring compounds that could affect human health, and (2) the protection of groundwater from contamination.

The POES coordinates many of the TGPC's educational outreach initiatives. The POES met 10 times during the biennium to coordinate activities with other state and federal organizations involved in public outreach and to develop and implement educational outreach programs on groundwater protection and environmental health issues which are targeted to serve specific groups. The POES developed a formal *Groundwater Educational Outreach Plan* with 10 focus areas in late 2006 and an associated *Implementation Strategy* with specific activities for each focus area in 2007 (both documents are available on the POES's web page).

During the last biennium, the TGPC continued its sponsorship of exhibitor booths and displays at 21 Austin-area conferences, seminars, and meetings with over 3,100 estimated visitors (10% of registered attendees) – a TGPC-sponsored poster was even displayed in the Texas Capitol for National Groundwater Awareness Week in both March 2007 and March 2008. From its

exhibitor booth, the TGPC distributed its trifold brochure and refrigerator magnets, state maps of various kinds (e.g., major and minor aquifers, river basins, precipitation, geology, TGPC member agency districts, and groundwater organizational areas), fact sheets, booklets, and a listing of groundwater publications available for download from the TGPC and other web sites.

Abandoned water wells provide a direct conduit for pollution occurring at the surface to enter groundwater resources. Recognizing the dangers to human health and groundwater

Strategy Recommendation

The TGPC recommends that the state continue to support the efforts of the Texas On-Site Wastewater Treatment Research Council, the Texas AgriLife Extension Service, the TCEQ's on-site wastewater program, and local governments in their efforts to develop and deliver effective educational material that addresses OSSF maintenance in order to prevent failures.

In addition, the government agencies involved in OSSF regulation and outreach may want to consider developing programs specially designed to reach and serve the state's high-growth counties.

quality that abandoned water wells pose, the POES worked with the Texas AgriLife Extension Service to develop and publish a fact sheet that explained how a landowner can cap currently unused water wells for future use (L-5490). In addition, the Texas AgriLife Extension Service held six TGPC-supported abandoned water well closures (i.e., well-plugging demonstrations) in four counties (twice in two counties) with an attendance of over 115 people.

Contamination and naturally occurring compounds in groundwater that can affect human health remain a focus of the TGPC's education and public outreach efforts. The

POES continued its coordination efforts with the Texas AgriLife Extension Service in expanding a package of educational material for outreach events. A fact sheet for private water well owners on Methyl Tertiary Butyl Ether (MTBE) (L-5502) was developed and published in English, the radionuclide fact sheet was published in Spanish (B-6192S), and the nitrate fact sheet (B-6184) was reprinted. These fact sheets contain information on the occurrence, health effects, testing options, and treatment options for these contaminants.

Strategy Recommendation

The state should undertake a voluntary program targeted at private well owners, designed to identify problem areas and assist private well owners in understanding these groundwater quality issues.

During the biennium, the Texas AgriLife Extension Service conducted a number of TGPC-supported educational events targeting water well owners, and the drinking water fact sheets were used in conjunction with their water well testing program – over 1,700 well samples were screened from over 25 counties at 25 events (more than once in 11 of these counties). An Outreach Events Status Report, listing both recent and upcoming TGPC booth displays, abandoned water well closures, and water well screening events, is now frequently updated on the POE web page.

An effective OSSF system (i.e., septic system) removes wastewater from the home, treats and distributes the wastewater, and protects both public health and water resources from contamination. An OSSF system must be routinely maintained to operate properly. Unlike a centralized sewer system maintained by a city or water district, maintenance of an OSSF system is the responsibility of the homeowner. With a statewide OSSF system failure rate of 13 percent and the growing dependence on OSSF systems in the suburban fringe, the TGPC is trying to provide information to individuals who are unaware of proper usage and maintenance of their OSSF system. The POES continued its coordination efforts with the Texas AgriLife Extension Service in expanding a package of educational material for outreach events. A fact sheet for private OSSF system owners regarding the understanding and maintenance of a septic system was developed and published (L-5491) and the graywater (B-6176) fact sheet was reprinted.

In order to provide the public with more educational outreach material related to groundwater and pesticides, the POES also coordinated efforts with the Texas AgriLife Extension Service in developing and publishing a *Best Management Practices to Prevent Pesticide Contamination* trifold brochure (L-5500) which discussed the properties of pesticides that can affect the risk of water contamination, the factors that can influence the movement of pesticides in the environment, and special steps that farmers, ranchers, homeowners, and small acreage landowners can take to protect our water from pesticides. In addition, the TGPC supported the reprinting of a Texas AgriLife Extension Service fact sheet which discussed how integrated weed management in lawns can protect the environment (L-5324).

Since many of the agencies involved in groundwater protection have several functions, their web sites are not organized around groundwater as a theme, making it difficult for the general public to find information on the state's groundwater protection efforts. The TGPC web site, <www.tgpc.state.tx.us>, was established prior to this biennium and is frequently updated with new information on groundwater protection activities. In addition to providing information about TGPC business to its members and the public, the web site is a clearinghouse for many groundwater-related topics, supplying links to the web sites and publications of TGPC members and other organizations. Addressing one of the focus areas in their *Groundwater Educational Outreach Plan*, the POES created a Frequently Asked Questions (FAQs) web page and posted over a dozen one- to two-page summaries of topics related to groundwater quantity and quality, septic systems, water wells, and administrative boundaries. These popular press articles will assist state-wide newsletter editors and webmasters in disseminating groundwater-related information to the public. Additional FAQ topics under development include oil and gas waste disposal wells and the state water plan. An email subscription service with almost 1,000 recipients is now used to notify the public of upcoming meetings and new TGPC web site information, and TGPC web site activity for the first six months of 2008 averaged 82 unique visitors per day.

Strategy Recommendation

Public educational materials and outreach programs are needed to educate domestic/ private well owners on drinking water quality and potential health risks.

More support needs to be given to educational efforts for targeted geographic areas of concern for high concentrations of naturally occurring groundwater contaminants and on various treatment options available to the domestic/private well owner.

Support is also needed for educational efforts to develop and deliver effective educational materials that target potential sources of contamination such as abandoned wells.

Special effort should be made to develop programs designed to reach and serve the state's high-growth areas.

Groundwater Research Activities

Traditional groundwater research organizations, generally associated with universities, in both the agricultural and natural resource sectors, have developed the experience, infrastructure, and technical expertise needed to address complex research needs. However, there is no formal mechanism to link TGPC

members that need research with the organizations that are capable of undertaking the research. The Groundwater Research

Strategy Recommendation

The TGPC should establish, on its web site, links to key groundwater information residing at state agencies and educational institutions.

Subcommittee was formed to identify interagency groundwater research needs and provide a coordinated approach in seeking potential funding sources.

The subcommittee has completed work on a template

for project-specific white papers. A document/white paper has been prepared by TWRI, "Influences of Natural and Man-Made Sources of Contamination on Water Quality Trends in the Seymour aquifer: A 2006 Status Report." The subcommittee has identified a number of research topics, and continues to serve as a forum for the exchange of ideas among the various agencies on groundwater research needs and on opportunities for potential sources of funding.

Strategy Recommendation

TGPC should form a research subcommittee to identify interagency research needs and to provide a coordinated approach for discussion with federal agencies for funding. The results of this work should be shared with the TCEQ for its consideration under the research model authorized under TWC 5.1191—5.1193.

The Groundwater Research Subcommittee met nine times during the biennium. Regularly scheduled items on the subcommittee's agenda included discussion of a Research Needs Matrix, prioritization of research for funding, and development of white papers (i.e., a one-page grant proposal). Presentations to the subcommittee during the biennium were:

- BEG's presentation on California's Ambient Groundwater Monitoring Program and its applicability to Texas, focusing primarily on the dating of groundwater through the use of tritium and helium-3 analyses; and
- TCEQ's presentation on Clean Water Act Section 319 grant program on providing funding for NPS water quality projects.

Intergovernmental Cooperation Activities

The TGPC and its subcommittees undertake intergovernmental efforts to fill gaps in service delivery and information exchange. These include: (1) notifying private well owners of groundwater contamination, (2) coordination with RWPGs, and (3) coordination with the federal government.

Private Well Owner Notification of Groundwater Contamination

TWC, 26.408 requires the TCEQ to inform owners of private drinking water wells, within 30 days of the date the TCEQ receives notice of groundwater contamination, that their well may be affected by contamination. GCDs in which the contamination is occurring are also notified.

The TGPC developed the form and content of the notice to the owners of private drinking water wells as required by 31 TAC 601.10. A copy of the rule can be found in Appendix 5.

The TCEQ uses the TGPC as an avenue for interagency communication. Staff has held meetings with the RCT, TWDB, TDA, and TDLR to describe the TCEQ responsibilities and internal protocol. The monitoring programs of these agencies were reviewed, and post-monitoring procedures, which might affect a case referral to the TCEQ, were clarified. Similar discussions are planned with TSSWCB, the Texas AgriLife Extension Service, and Texas AgriLife Research.

Coordination with Regional Water Planning Groups

During the development of the *Strategy*, the TGPC recognized that the State's RWPG were relying heavily on GAMs and quantity information, but may have been failing to account for groundwater availability issues caused by aquifer impairments. TGPC now provides reports, such as the *Joint Reports*, to RWPGs.

The TWDB representative of the TGPC now reports quarterly on the status of RWPG activities and the TWDB's GAM efforts.

Coordination with the Federal Government

EPA, through the Clean Water Act, has provided grants to the state since 1985 to: (1) promote the coordination of groundwater protection activities of federal and federally-delegated regulatory programs; and (2) foster a more comprehensive approach to groundwater protection. In addition, starting in 1992, EPA has provided grants to the state under the FIFRA for groundwater protection activities specifically related to pesticide use and effects on groundwater.

The TGPC leads initiatives, in partnership with federal agencies, to develop a state groundwater protection strategy and implement PMP activities to protect groundwater from

Strategy Recommendation

The TGPC needs to strengthen the lines of communication and information sharing with the State's RWPG. The lack of communication between these two groups is a gap in the TGPC's ability to coordinate the state's groundwater protection strategy with the state's water supply planning efforts led by the TWDB.

contamination. Current state and federal cooperative efforts include identifying potential improvements to the state's groundwater quality monitoring effort and ensuring that those efforts are consistent with national monitoring initiatives.

In addition, the TGPC regularly provides input at the national level to federal agencies through the Ground Water Protection Council (an association of state groundwater and underground injection control program directors), the State FIFRA Issues Research Evaluation Group (a group formed by state agricultural regulatory officials and EPA to discuss and evaluate pesticide matters affecting states), the National Water Quality Monitoring Council (an advisory group to the USGS and EPA), and other state and federal stakeholder and regulatory guidance groups.

The TGPC works closely with the USGS, the federal agency with hydrogeologic responsibilities that include national level geologic mapping and hydrologic studies. USGS participates in TGPC-sponsored projects and subcommittees, providing both groundwater expertise and opportunities for state input into federally-sponsored research.

TGPC Administrative Activities

The TGPC carries out numerous administrative duties required by state law, such as developing this biennial report to the Legislature, holding required quarterly meetings, and ensuring that documents are maintained in a manner that makes them easily accessible to the public. In addition, the TGPC and its subcommittees are subject to the state's open-meeting laws. Periodically, state laws are enacted that require the TGPC to undertake rulemaking. Much of the TGPC's work is performed in quarterly meetings and through the efforts of its subcommittees.

Legislative Report Development

The Legislative Report Subcommittee met three times during the biennium to coordinate the drafting of the recommendation portion of the Activities and Recommendations of the TGPC are required by TWC, 26.405. The subcommittee develops, for full TGPC approval, groundwater protection recommendations for legislative consideration.

Actions on Recommendations to the 80th Legislature

The 80th Legislature addressed five of the 15 recommendations forwarded by the TGPC in January 2007 by:

- continuing funding for brush control in order to enhance the availability of both groundwater and surface water

- facilitating Disposal/Use of Desalination Concentrate and Drinking Water Treatment Residuals
- funding the TWDB's Municipal Water Conservation Programs
- improving the State's Groundwater Database
- providing some funding to support "desired future conditions".

Meetings and Presentations

The TGPC met quarterly during the biennium, as required by TWC, 26.404. Regularly scheduled items on the TGPC's agenda included subcommittee reports, presentations and roundtable discussions, business, information exchange, announcements, and public comment. In addition, agencies share and discuss current and ongoing rule development relating to the protection of groundwater.

The TGPC regularly receives groundwater-related presentations. Presentations during biennium were:

- TWDB's Story of Growth and Gas – Groundwater Use and its Effects on Water Levels in North-Central Texas
- TCEQ's North-Central and Central Texas Update PGMA Studies for the Trinity Aquifer
- UT-BEG's Overview of Carbon Capture and Storage in Texas
- TCEQ's Central Texas Priority Groundwater Management Area Update Study for the Trinity Aquifer
- TCEQ's Groundwater Assessment portion of the 2008 Texas Water Quality Inventory
- TCEQ's Continuous Automated Groundwater Monitoring

Subcommittees

The TGPC uses subcommittees and task forces to perform much of its work and to address issue and program development. The TGPC considers subcommittee findings and recommendations at regular meetings. The following subcommittees and task forces were used during the biennium:

- Agricultural Chemicals Subcommittee
 - State Management Plan Task Force
 - Educational Task Force
 - Site Selection Task Force
 - Data Evaluation and Interpretation Task Force
 - BMPs Task Force
- Groundwater Data Management Subcommittee

- Groundwater Research Subcommittee
- Legislative Report Subcommittee
- Public Outreach and Education Subcommittee

The NPS Task Force was deactivated in April 2008 and a TGPC NPS Pollution Liaison (i.e., the TSSWCB representative to the TGPC) will be used to exchange information between the TGPC and the TCEQ and TSSWCB NPS Pollution program teams. The Charges for all remaining TGPC Subcommittees were updated in 2008.

Rules and Quadrennial Review

The TGPC rules (Appendix 5) define the environmental conditions that constitute groundwater contamination for inclusion of cases in public files of state agencies having groundwater protection responsibilities. The rules describe the contents of the TGPC's *Joint Report* and specify the form and content of notices of groundwater contamination.

The TGPC is required to develop and implement a rules review plan for the periodic review and re-adoption of its rules in accordance with Government Code §2001.039. The TGPC adopted the rules review, proposed rules, and updated rules review plan during the last biennium.

Public Records and Public Meetings

State law requires the TCEQ to be the TGPC's administrative agent. As such, the TCEQ maintains a mailing list of the TGPC members, designated and alternate members, subcommittee members, and agency staff for correspondence. The TCEQ also uses an e-mail subscription service to notify all TGPC members, agency staff, and interested parties of upcoming meetings. The TCEQ provides meeting information through the *Texas Register* for public notification, maintains audio tapes of the TGPC meetings, prepares meeting records, and keeps meeting and correspondence files for the TGPC and subcommittees. In addition, the TGPC publishes documents that are available through the TCEQ's Agency Communications Division. See Appendix 6 for a complete list of the TGPC publications.

Like other state agencies, the TGPC is subject to the state's open-meetings laws. Meeting notices are provided to the *Texas Register*, notices of upcoming meetings are sent to the TGPC e-mail distribution list, and meeting information is also posted on the TGPC web site.

Information is also made available to the public through the TGPC web site at <<http://www.tgpc.state.tx.us>>.

Appendix 1. Texas Groundwater Protection Committee Membership

Chairman—Texas Commission on Environmental Quality	
<p>Mark Vickery, Executive Director, MC-109 Texas Commission on Environmental Quality PO Box 13087 Austin TX 78711-3087 Telephone: 512-239-3900 Fax: 512-239-3939</p>	<p><i>Designated Chairman:</i> Cary Betz, Senior Policy Analyst Water Supply Division, MC-154 Texas Commission on Environmental Quality PO Box 13087 Austin TX 78711-3087 Telephone: 512-239-4506 Fax: 512-239-6145 E-mail: cbetz@tceq.state.tx.us</p>
Vice-Chairman—Texas Water Development Board	
<p>J. Kevin Ward, Executive Administrator Texas Water Development Board PO Box 13231 Austin TX 78711-3231 Telephone: 512-463-7850 Fax: 512-475-2053</p>	<p><i>Designated Vice-Chairman:</i> Robert Mace, PhD, Director Groundwater Resources Division Texas Water Development Board PO Box 13231 Austin TX 78711-3231 Telephone: 512-936-0861 Fax: 512-936-0889 E-mail: robert.mace@twdb.state.tx.us</p>
Railroad Commission of Texas	
<p>Richard A. Varela, Executive Director Railroad Commission of Texas PO Box 12967 Austin TX 78711-2967 Telephone: 512-463-7068 Fax: 512-463-7000</p>	<p><i>Designated Representative:</i> Leslie Savage, Assistant Director Railroad Commission of Texas PO Box 12967 Austin TX 78711-2967 Telephone: 512-463-7308 Fax: 512-463-6780 E-mail: leslie.savage@rrc.state.tx.us</p>
Texas State Soil and Water Conservation Board	
<p>Rex Isom, Executive Director Texas State Soil and Water Conservation Board PO Box 658 Temple TX 76503-0658 Telephone: 254-773-2250 Fax: 254-773-3311</p>	<p><i>Designated Representative:</i> Donna Long, Water Quality Specialist Texas State Soil and Water Conservation Board PO Box 658 Temple TX 76503-0658 Telephone: 254-773-2250, ext. 228 Fax: 254-773-3311 E-mail: dlong@tsswcb.state.tx.us</p>
Texas Department of Agriculture	
<p>Drew DeBerry, Deputy Commissioner Texas Department of Agriculture PO Box 12847 Austin TX 78711-2847 Telephone: 512-463-7567 Fax: 512-463-6072</p>	<p><i>Designated Representative:</i> Ambrose Charles, PhD Deputy Assistant Commissioner for Pesticides Texas Department of Agriculture PO Box 12847 Austin TX 78711-2847 Telephone: 512-463-7699 Fax: 888-216-9834 E-mail: ambrose.charles@tda.state.tx.us</p>

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Department of State Health Services	
David Lakey, MD, Commissioner Department of State Health Services 1100 West 49th Street Austin TX 78756 Telephone: 512-458-7375 Fax: 512-458-7477	<i>Designated Representative:</i> Ken Ofunrein, Group Manager Compliance Inspections Group South Environmental & Consumer Safety Section Department of State Health Services 1100 West 49th Street Austin TX 78756 Telephone: 512-834-6770, ext. 2451 Fax: 512-834-6644 E-mail: ken.ofunrein@dshs.state.tx.us
Texas Department of Licensing and Regulation	
David Gunn Texas Department of Licensing and Regulation Water Well Drillers and Pump Installers Program PO Box 12157 Austin TX 78711 Telephone: 512-463-7880 Fax: 512-463-8616 E-mail: david@license.state.tx.us	<i>Designated Representative:</i> Same
Texas Alliance of Groundwater Districts	
Janet Adams, Manager Jeff Davis County UWCD President, Texas Alliance of Groundwater Districts PO Box 1203 113 State Street Fort Davis TX 79734 Telephone: 432-426-3441 Fax: 432-426-2087	<i>Designated Representative</i> David Van Dresar, General Manager Fayette County GCD PO Box 625 La Grange TX 78945 Telephone: 979-968-3135 Fax: 979-968-3194 E-mail: fcgxcd@verizon.net
Texas AgriLife Research	
Mark Hussey, PhD, Director Texas AgriLife Research 113 Jack K. Williams Building 2142 TAMU College Station TX 77843-2142 Telephone: 979-845-7980 Fax: 979-458-4765	<i>Designated Representative</i> C. Allan Jones, PhD, Director Texas Water Resource Institute 2118 TAMU College Station TX 77843-2118 Telephone: 979-845-1851 Fax: 979-845-8554 E-mail: cajones@tamu.edu
Bureau of Economic Geology	
Scott Tinker, PhD, Director Bureau of Economic Geology Jackson School of Geosciences The University of Texas at Austin University Station, Box X Austin TX 78713-8924 Telephone: 512-471-1534 Fax: 512-471-0140	<i>Designated Representative</i> Bridget Scanlon, PhD, Senior Research Scientist Bureau of Economic Geology Jackson School of Geosciences The University of Texas at Austin University Station, Box X Austin TX 78713-8924 Telephone: 512-471-8241 Fax: 512-471-0140 E-mail: bridget.scanlon@beg.utexas.edu

Appendix 2. Texas Groundwater Protection Strategy

Background

The Legislature charged the TGPC with developing and updating a comprehensive groundwater protection strategy for the state that provides guidelines for the prevention of contamination and for the conservation of groundwater and provides for the coordination of the groundwater protection activities of the agencies represented on the TGPC.

With the continuing focus on the need for assuring a high quality supply of groundwater in the state, and recognizing the programmatic changes that have occurred since the state's first groundwater protection strategy was developed in 1988, the TGPC decided in January 2001 to update the state's groundwater strategy. The TGPC issued the revised *Strategy* in February 2003.

State Groundwater Protection Strategy

In developing the *Strategy*, the TGPC recognized that the state has numerous successful groundwater programs spread among local and state governmental agencies and research institutions. Therefore, a key part of the *Strategy* documented how the current regulatory, outreach, and research programs work to protect groundwater resources. A second fundamental component of the *Strategy* was the identification of protection gaps in program implementation or coordination. TGPC believes that this approach to developing the *Strategy*, grounded firmly within the existing policy and programmatic directions given by the Legislature, resulted in a document that sets realistic objectives for success and provides a road map for action over the next 5 to 15 years.

The *Strategy* provides recommendations and possible actions to protect groundwater. The following discusses each *Strategy* recommendation that was given in Chapter X: Recommendations for Action and the TGPC's and member agency response to the recommendations.

Implementation of Strategy Recommendations

Over the past two years, the Groundwater Research Subcommittee, the POES, and the Data Management Subcommittee were charged with implementing specific recommendations given in the *Strategy*. The charge to the ACS was reviewed and revised to provide assistance and further coordination for addressing recommendations and issues identified in the *Strategy*. The subcommittees were given the

ongoing responsibility to report quarterly at the TGPC's regularly scheduled meeting on subcommittee activities. A discussion of the progress in implementing the *Strategy's* recommendations follows.

Strengthen Communication with the State's Water Planning Efforts

Strategy Recommendation. *The TGPC needs to strengthen the lines of communication and information sharing with the State's RWPG. The lack of communication between these two programs is a gap in the TGPC's ability to coordinate the state's groundwater protection strategy with the state's water supply planning efforts led by the Texas Water Development Board. (Short-term 5-year Goal)*

Response. The TWDB representative of the TGPC now reports quarterly on the status of RWPG activities and the TWDB's Groundwater Availability Modeling efforts.

Improve Groundwater Data

Strategy Recommendation. *Gaps exist in the data collection and data assessment processes. The existing groundwater quality monitoring programs need more resources to sample additional sites that will provide a better picture of groundwater conditions statewide. The parameters that are analyzed need to be expanded to include organic and synthetic chemicals. While site-specific assessment of hazardous wastes in groundwater is covered by a number of state and federal programs, other substances in groundwater, such as nitrate and arsenic that may be deemed naturally occurring need better assessment. The TGPC should develop recommendations on the design of a groundwater monitoring system that will meet the needs of all member agencies and organizations. Any new monitoring of domestic water wells would be on a voluntary basis. (Short-term 5-year Goal)*

Response. Throughout the biennium, staff from member agencies and organizations worked on refining the second phase of a groundwater monitoring strategy. This monitoring strategy is intended to address current and future needs for groundwater quality and quantity data. While the first phase identified a three-tiered monitoring concept that provides a foundation for building a more detailed monitoring program, the second phase of the monitoring strategy refines the monitoring concepts, and proposes two assessment methodologies, one for the data collected under the new strategy, and another for legacy data.

Once completed, implementing the strategy should improve the groundwater portion of the Texas Water Quality Inventory

[305(b) Report]. Enhanced monitoring and new assessment methodologies for groundwater quality data will result in a more concise and usable version of the report when submitted to the EPA. While the current report is prepared by interagency cooperation, primarily between the TWDB and the TCEQ, data gaps that were identified in the *Strategy* will be addressed, and accurate reporting of specific, as opposed to generalized, groundwater quality issues will be possible.

The TGPC has also been the primary coordination mechanism for exchanging information of various data collection and assessment initiatives by the member agencies and organizations. The development of spatial databases for groundwater contamination sites is an example of the type of initiative undertaken by member agencies and organizations—the TCEQ and the RCT are both working on spatial datasets for contamination sites under their individual jurisdictions. These spatial datasets are being developed as needed by specific programs within the agencies, and will be able to be utilized by other programs using common data elements. Progress on these efforts is being monitored by TGPC support staff.

Strategy Recommendation. *Data management is a dynamic process and, as such, accepted data management standards may become outdated or superseded by a better, newer standard. It is imperative that these data management standards be periodically reviewed and amended to facilitate information exchange. The TGPC must review and revise its groundwater data management standards and guidelines, and must actively participate in the various data management advisory groups. (Short-term 5-year Goal)*

Response. The TGPC published the *Texas Groundwater Data Dictionary* in August 1996. During 2005, the GDMS of the TGPC submitted this document to the TGIC for review of the spatial data elements for adequacy. TGIC reported that the spatial data elements in the dictionary met the state's requirement for minimum data elements and did not recommend any changes.

Other data elements contained in the dictionary have been informally identified as potentially needing revision. The TGPC is presently working on the formal identification of any outdated data elements, and, based on the results of this identification, will determine whether a revision of the dictionary is necessary.

Data management systems are improving daily. Data storage capacity is much larger today than when the *Strategy* was crafted, and retrieval methods are much easier and faster. Despite these improvements, designing a centralized data management system remains an expensive proposition, in terms of both capital expense and workforce allocation. The TGPC has focused efforts toward developing data management methods that will work

with existing databases and/or new databases under construction. Identification of common data elements within these databases is essential to provide access to the widest array of data for all users.

Adding new pesticide sampling data is an ongoing effort of the TGPC. During the biennium, available data was evaluated and a report was prepared describing the status of pesticide occurrence in groundwater. The report is available from the TGPC web site.

Strategy Recommendation. *The need for a geographic information systems/relational database for waste site and groundwater contamination site characterizations is critical to any planning process. All available data sources should be checked for validity via accepted quality assurance and quality control measures, and once accepted, placed into an electronic format with a spatial data element for indexing in a relational database. The location and geometry of contamination plumes should be placed in a GIS format. (Medium-term 10-year Goal)*

Response. In 2006, staff preparing the *Joint Groundwater Monitoring and Contamination Report—2005* conducted a trial acquisition of spatial data for groundwater contamination sites in the report. This effort continued and improved during preparation of the 2006 and 2007 reports. Staff was able to provide accurate locations for 99% of the 5,223 sites reported by the TCEQ in 2006, and 4,893 reported in 2007. The RCT continues their current work on developing a spatial database for these sites. Staff remains optimistic about plans to convert the *Joint Report* to a web-based, spatial presentation format within the next report cycles.

Strategy Recommendation. *The TDLR has developed a relational database that includes water well driller information, the water well driller's reports, and reports of encountering undesirable water zones when wells are drilled, in a spatial coordinate (latitude and longitude) database. There is a large number of existing hard-copy water well drillers reports that need to be placed in a digital format and made accessible through the existing system. (Medium-term 10-year Goal)*

Response. During the biennium, the TCEQ undertook conversion of paper Water Well Reports to a digital format. The large number of paper records (800,000+), has been digitally imaged and indexed according to state water well grid number. This system emulates the paper file system that has been in place for years; however, it provides more reliable accessibility and much needed disaster backup. Files may presently be accessed from computer kiosks in the TCEQ Central File Room, with plans to initiate a web-based access system within the next biennium.

Coordinate Research

Strategy Recommendation. *Traditional groundwater research organizations, generally associated with universities, in both the agricultural and natural resource sectors, have developed the experience, infrastructure, and technical expertise needed to address complex research needs. However, there is no formal mechanism to link the agencies on the TGPC that need research performed together with the organizations that are capable of performing the research. The TGPC should form a research subcommittee to identify interagency research needs and to provide a coordinated approach for discussion with federal agencies for funding. The results of this work should be shared with the TCEQ for its consideration under the research model authorized under TWC Sections 5.1191–5.1193. (Short-term 5-year Goal)*

Response. The Groundwater Research Subcommittee was formed to meet a need for a coordinating group to work with state agencies, such as the TCEQ, TWDB, RCT, TDA, DSHS, the TSSWCB, and with traditional research organizations, such as universities and the USGS, to identify interagency groundwater research needs and provide a coordinated approach in seeking potential funding sources.

A document/white paper has been prepared by TWRI entitled “Influences of Natural and Man-Made Sources of Contamination on Water Quality Trends in the Seymour Aquifer: A 2007 Status Report.” The subcommittee has identified a number of research topics, and continues to serve as a forum for the exchange of ideas between the various agencies on groundwater research needs and opportunities for potential sources of funding.

Increase Public Outreach

Strategy Recommendation. *Virtually all water used in rural homes, not connected to a public drinking water system, comes from domestic/private water wells. There are no specific programs that routinely examine the quality of groundwater being consumed by Texans utilizing these wells. More water quality information is needed to develop assessments of water quality and health risk for the domestic/private well owner segment of the population. The state should undertake a voluntary program targeted at private well owners, designed to identify problem areas and assist private well owners in understanding these groundwater quality issues. (Short-term 5-year and Medium-term 10-year Goal)*

Response. The Charges to the TGPC POES and Groundwater Research Subcommittees were updated in 2008 to include a requirement to meet annually with the TCEQ and TSSWCB NPS teams in order to share information, discuss NPS projects, and

facilitate NPS grant proposals by TGPC member agencies. In order to provide the public with more educational outreach material related to groundwater and pesticides, the POES also coordinated efforts with the Texas AgriLife Extension Service in developing and publishing a *Best Management Practices to Prevent Pesticide Contamination* trifold brochure (L-5500) which discussed the properties of pesticides that can affect the risk of water contamination, the factors that can influence the movement of pesticides in the environment, and special steps that farmers, ranchers, homeowners, and small acreage landowners can take to protect our water from pesticides. In addition, the TGPC supported the reprinting of a Texas AgriLife Extension Service fact sheet which discussed how integrated weed management in lawns can protect the environment (L-5324).

Strategy Recommendation. *Public educational materials and outreach programs are needed to educate domestic/private well owners on drinking water quality and potential health risks. More support needs to be given to educational efforts for targeted geographic areas of concern for high concentrations of naturally occurring groundwater contaminants and on various treatment options available to the domestic/private well owner. Support is also needed for educational efforts to develop and deliver effective educational materials that target potential sources of contamination such as abandoned wells. Special effort should be made to develop programs designed to reach and serve the state's high-growth areas. (Short-term 5-year and Medium-term 10-year Goal)*

Response. The POES worked with the Texas AgriLife Extension Service to develop and publish a fact sheet that explained how a landowner can cap a currently unused water well for future use (L-5490). In addition, the Texas AgriLife Extension Service held six TGPC-supported abandoned water well closures (i.e., well-plugging demonstrations) in four counties (twice in two counties) with an attendance of over 115 people. The POES continued its coordination efforts with the Texas AgriLife Extension Service in expanding a package of educational material for outreach events. A fact sheet for private water well owners on Methyl Tertiary Butyl Ether (MTBE) (L-5502) was developed and published in English, the radionuclide fact sheet was published in Spanish (B-6192S), and the nitrate fact sheet (B-6184) was reprinted. These fact sheets contain information on the occurrence, health effects, testing options, and treatment options for these contaminants.

During the biennium, the Texas AgriLife Extension Service conducted a number of TGPC-supported educational events targeting water well owners, and the drinking water fact sheets were used in conjunction with their water well testing program

through which over 1,700 well samples were screened from over 25 counties at 25 events (more than once in 11 of these counties).

In addition, the TGPC continued its sponsorship of exhibitor booths and displays at 21 Austin-area conferences, seminars, and meetings with over 3,100 estimated visitors (10% of registered attendees) – a TGPC-sponsored poster was even displayed in the Texas Capitol for National Groundwater Awareness Week in both March 2007 and March 2008. From its exhibitor booth, the TGPC distributed its trifold brochure and refrigerator magnets, state maps of various kinds (e.g., major and minor aquifers, river basins, precipitation, geology, TGPC member agency districts, and groundwater organizational areas), fact sheets, booklets, and a listing of groundwater publications available for download from the TGPC and other web sites.

Strategy Recommendation. *An effective on-site system removes wastewater from the home, treats and distributes the wastewater, and protects our water resources. An on-site wastewater system requires maintenance in order to maintain proper operation and environmental protection. Unlike a centralized sewer system maintained by a city or water district, maintenance of an on-site system is the responsibility of the homeowner. A statewide OSSF failure rate of 13 percent and the growing dependence on these systems in the suburban fringe around urban areas continues to create human health and environmental concerns. Therefore, the TGPC recommends that the state continue to support the efforts of the On-Site wastewater Treatment Research Council, the Texas AgriLife Extension Service, the TCEQ's on-site wastewater program, and local governments in their efforts to develop and deliver effective educational material that addresses OSSF maintenance in order to prevent failures. In addition, the government agencies involved in OSSF regulation and outreach may want to consider developing programs specially designed to reach and serve the state's high growth counties. (Short-term 5-year and Medium-term 10-year Goal)*

Response. During the last biennium, the POES continued its coordination efforts with the Texas AgriLife Extension Service in expanding a package of educational material for outreach events. A fact sheet for private OSSF system owners regarding the understanding and maintenance of a septic system was developed and published (L-5491) and the graywater (B-6176) fact sheet was reprinted.

Strategy Recommendation. *Oftentimes, state agency web pages are not organized around groundwater as a theme, making it difficult for the general public to find information on the state's groundwater protection efforts. To remedy this, the TGPC should establish, on its web page, links to key groundwater information*

residing at state agencies and educational institutions. (Short-term 5-year Goal)

Response. The TGPC web site (www.tgpc.state.tx.us) has been frequently updated with new information on groundwater protection activities. In addition to providing information about TGPC activities to its members and the public, the web site serves as a clearinghouse for many groundwater-related topics such as general groundwater information; pesticides; water wells; septic systems; groundwater contamination; oil, gas, and mining; and water conservation. The web site supplies links to other web sites as well as publications of its members and other organizations. Addressing one of the focus areas in their newly developed *Groundwater Educational Outreach Plan* and associated *Implementation Strategy* (available on the POES web page), the POES created a Frequently Asked Questions (FAQs) web page and posted over a dozen one- to two-page summaries of topics related to groundwater quantity and quality, septic systems, water wells, and administrative boundaries. These popular press articles will assist state-wide newsletter editors and webmasters in disseminating groundwater-related information to the public. Additional FAQ topics under development include oil and gas waste disposal wells and the state water plan.

Instituted during the last biennium, an email subscription service with almost 1,000 recipients is now used to notify the public of upcoming meetings and new TGPC web site information, driving an increase in TGPC web site activity (the first six months of 2008 averaged 82 unique visitors per day). In addition an Outreach Events Status Report, listing both recent and upcoming TGPC booth displays, abandoned water well closures, and water well screening events, is now frequently updated on the POES web page.

Commit to Development of Periodic Updates and Improvements to the State Groundwater Protection Strategy

Strategy Recommendation. *The first groundwater strategy was developed in 1988 and has not been updated prior to this document. The TGPC should update the Strategy every 6 years. (Short-term 5-year and Medium-term 10-year Goal)*

Response. The TGPC has undertaken review and revision of the *Strategy* in 2008, and plans for publication in 2009.

Strategy Recommendation. *As part of the ongoing process for developing the next Strategy, the TGPC intends to conduct an analysis that will identify and rank threats to groundwater quality*

(taking into consideration the vulnerability of groundwater resources and using available data), and prioritize possible actions that address those threats. Such an analysis would provide a valuable tool to both TGPC member agencies and organizations, and state legislators as they go about setting groundwater protection policy. (Short-term 5-year and Medium-term 10-year Goal)

Response. The compilation of spatial data for cases in the *Joint Report* represents a major step forward in identifying threats to groundwater quality from regulated activities, or conversely, determining where regulatory programs have been effective in maintaining the quality of groundwater. Use of this data with legacy data in the assessment methodology currently under development for the Joint Groundwater Monitoring Strategy, will assist in establishing locations targeted for more intensive or rigorous groundwater monitoring.

Additionally, the most recent format of the Groundwater Assessment portion of the Texas Water Quality Inventory [305(b) *Report*] has been adopted in order to make identification and ranking of threats to groundwater quality possible. In the 2008 version of the report, the data, and the graphical presentation of the data, have been continued to cover all major and minor aquifers in the state.

Concentrations of multiple “constituents of concern” that exceed some generally accepted environmental or health based action levels, are developed using GIS into a graphic format, with symbols showing the locations and relative concentrations of parameters sampled during the most recent round of sampling for each aquifer.

Data from the TWDB’s Database is used for this effort, along with data from the TCEQ’s Public Drinking Water Database and Interagency Pesticide Database.

Appendix 3. State Management Plan for the Prevention of Pesticide Contamination of Groundwater

Plan Development

The TCEQ is charged under TWC §26.407 to develop management plans for agricultural chemicals, with the advice of the TGPC. These plans will address agricultural chemicals such as pesticides that may threaten groundwater quality. Specifically, these plans are developed for the protection and enhancement of water quality pursuant to federal statute, regulation, or policy, and include management plans for the prevention of water pollution by agricultural chemicals and agents.

At the request of the TCEQ, in 2001, the TGPC developed the Texas State Management Plan for Prevention of Pesticide Contamination of Groundwater or SMP. These management plans were initially referred to as SMPs, but more recently are referred to as Pesticide Management Plans or PMPs. The plan, as a generic PMP for the state, serves as a guide that addresses the prevention of pesticide contamination and actions that will be used by the state to respond to contamination when it is found. The plan was developed as a joint effort of the agency members of the ACS. The plan received input from agricultural producers, manufacturers, and environmental interest groups. The TGPC effort considered the guidance provided by the United States Environmental Protection Agency's (EPA's) Ground-Water Protection Strategy and the Final Guidance for Pesticides and Ground-Water SMPs. The effort is an update of the Texas SMP for Agricultural Chemicals in Ground Water, published by the TGPC in 1991.

EPA has decided not to finalize rules on this topic first proposed in 1996. However, EPA continues to advocate their policy on addressing pesticides in groundwater through the PMP process and provides continued grant support for this program.

The goal of the PMP is to protect the existing quality of groundwater and to prevent the degradation of state groundwater resources. This goal does not mean zero-contaminant discharge, but rather that the use of pesticides is conducted according to the label and in a manner that will maintain present groundwater uses and not impair potential uses of groundwater or pose a public health hazard. All usable and potentially usable

groundwater resources are subject to the same protection afforded by the state's non-degradation policy goal.

The PMP describes the general policies and regulatory approaches the state will use to protect groundwater resources from risk of contamination by pesticides. The document describes a generic coordinating mechanism among all responsible and participating agencies during the implementation of the PMP and provides for specific responses when it is deemed necessary to take specific actions to protect groundwater. The PMP reflects the state's philosophy toward groundwater protection and recognizes the importance of agriculture to the state's economy.

Since 2006, EPA began shifting program focus to the completion of Program Assessment Measures and the assessment of some 57 pesticides for POI or POC. Many of these pesticides are not monitored by the state and will require a shift in future monitoring activities. The PAMs require annual on-line entry into a database. EPA is also attempting to integrate surface water into the existing groundwater pesticide program. Since Texas' pesticide program is for groundwater, Texas must rely on the data and information provided by the surface water programs on pesticides, for which there is no authority requiring them to comply with this unfunded task. Furthermore, EPA is requiring all pesticide monitoring data be provided in a specific format, which will require some effort and resources to develop and implement. These changes will result in Texas having to be even more creative to stretch resources and provide for these additional tasks without an increase in the program budget.

Groundwater Monitoring Plan for Atrazine and Metolachlor

Monitoring efforts have been significantly enhanced through a cooperative sampling effort among the TWDB, a number of GCDs, and the TCEQ. The TWDB or a GCD obtains a groundwater sample, in the course of their regular monitoring program, and then the TCEQ conducts the screening analyses for atrazine and metolachlor. Through this cooperative effort over 3000 samples were obtained and analyzed since 2000. Using an immunoassay screening method, all samples were analyzed for atrazine and most for metolachlor. Since the previous biennium, the focus has been on atrazine and the metolachlor monitoring has been discontinued in the cooperative screening task.

During the first five years of this cooperative sampling effort, samples from all of the aquifers that the TWDB monitors have been screened for atrazine and metolachlor. The monitoring program is into the third round of TWDB's four-year monitoring

cycle. Thus far, monitoring continues to reveal atrazine detections in the central Texas Panhandle but only occasional low-level detections of atrazine in the rest of the state. The cooperative monitoring atrazine detections lie in the same region of the Panhandle as previous investigative monitoring detections. All but one of the cooperative monitoring detections has been significantly below the MCL for drinking water.

Groundwater Monitoring for Urban Pesticides

Changes in the EPA grant during the past biennium include the assessment of POI and POC, from a list of 57 pesticides identified by a national work group. Many of these pesticides are not monitored in Texas, especially those identified as the most commonly used urban pesticides. Since Texas has a relatively minor impact from agricultural pesticides on groundwater, the ACS decided to monitor for as many of the urban pesticides as feasible. The program will enable the thorough assessment of these pesticides, fulfill grant requirements, and enable Texas to determine if these pesticides are impacting the groundwater in major metropolitan areas.

TCEQ screened 49 wells and 4 springs for atrazine, diazinon, chlorpyrifos, pyrethroids, and organo-phosphates/carbamates in the Austin and San Antonio metro areas in 2007. The program was expanded in 2008 to include 109 wells and 21 springs in Austin, San Antonio and Houston, while also including 18 laboratory analyses for at least 15 of the 57 pesticides in need of assessment. The success from the previous year led to greater cooperation by various entities, an increase in not only samples, but the number of immunoassay analyses (601) and the number of lab analyses (18). The analytical results for the biennium indicate only a few samples with trace amounts (most <0.1 ppb) of atrazine and diazinon. There appear to be no significant impacts by these pesticides on the groundwater in these 3 metro areas.

Response to Contamination

Response to a confirmed case of pesticide contamination of groundwater is outlined in the PMP. The determination of the appropriate response considers a number of key issues:

- Whether the contamination is from a point or NPS;
- The extent of the contamination; the level of contamination, either above or below the drinking water MCL or Health Advisory Level;
- The travel time from the application of the pesticide at or near the soil surface until it reaches the water table; and

- Is the source of contamination the result of present usage of the pesticide or usage under previous labels, which allowed greater levels of usage?

Investigative and follow-up monitoring efforts have been conducted at five sites in the central Panhandle and these activities have continued throughout the biennium to annually monitor atrazine detections in PWS wells. Monitoring reveals that atrazine concentrations have primarily decreased or remained the same over the past five years. At present, none of the PWS wells have atrazine concentrations above or even near the MCL. Stability or decrease in concentrations has caused a change from annual to biennial monitoring of the impacted wells for the ongoing monitoring program in the Panhandle region.

The investigations of these sites indicate that most of the atrazine contamination cases are due to point sources, such as an improperly abandoned water well that may have served as a migration pathway for atrazine. However, the investigations also found that there is some possibility of NPS contamination where the source of atrazine may be agricultural fields or storm water runoff collection in playa lake basins where public water wells are located.

In response to a few low-level detections of the pesticide atrazine in groundwater over a broad area, the TGPC worked with the Lubbock staff of the Texas AgriLife Extension Service to develop a tri-fold brochure on pesticide BMPs for private well owners, as well as several related sets of Frequently Asked Questions for the TGPC Website in 2008. Presentations were given by the AgriLife Extension Service personnel in 2007 and 2008, at several events each year. The TDA also utilized some of this material to train their inspectors in 2008. The curriculum and training are a result of interagency coordination and cooperation in monitoring, education and outreach under the PMP.

In response to trace detections of atrazine and diazinon in urban groundwater, the ACS worked with the Extension Service in 2008 to develop the FAQs and tri-fold brochure for private well owners. Additionally, some ACS members have attended meetings conducted by the City of Austin as part of their "Grow Green" program to educate citizens on the issues with Weed & Feed in an effort to reduce pesticide runoff into local groundwater and surface water.

Appendix 4. Annual Joint Groundwater Monitoring and Contamination Reports

The TGPC is required under TWC §26.406 to publish an annual groundwater monitoring and contamination report which:

- describes the current status of groundwater monitoring activities conducted or required by each agency at regulated facilities or associated with regulated activities;
- contains a description of each case of groundwater contamination documented during the previous calendar year;
- contains a description of each case of contamination documented during previous periods for which enforcement action was incomplete at the time of issuance of the preceding report; and
- indicates the status of enforcement action for each case of contamination that is listed.

The TGPC produced and published two monitoring and contamination reports during the previous two years: *Joint Groundwater Monitoring and Contamination Report—2006* (TGPC, 2007) and *Joint Groundwater Monitoring and Contamination Report—2007* (TGPC, 2008). The *Joint Report* describes the status of groundwater monitoring programs and groundwater contamination cases documented or under enforcement by the participating agencies for the calendar year. Each agency or organization includes a description of their programs that protect groundwater. The *Joint Report* contains a brief description of each case of groundwater contamination, listed by county and regulatory agency, and includes the enforcement status for the case.

Groundwater Monitoring

The groundwater protection programs of the members of the TGPC generally fall within one of three categories:

- regulatory agencies requiring or conducting groundwater monitoring to assure compliance with guidelines and regulations for the protection of groundwater from discharges of contaminants;
- agencies or entities conducting groundwater monitoring to assess ambient or existing groundwater quality conditions and to track changes in water quality over time; and
- agencies or entities conducting research activities related to groundwater resources and groundwater conservation.

Each regulatory agency that requires or conducts groundwater monitoring to assure compliance with guidelines and regulations for the protection of groundwater from contaminants has its own monitoring program requirements and procedures. The criteria used to assess the need for groundwater monitoring vary among the regulatory entities. Currently, there are 17 regulatory monitoring programs within two state agencies.

Monitoring of groundwater quality for permit and operational requirements occurred at approximately 11,000 facilities statewide in 2006. Approximately 52,455 monitor wells were used in 2006, and 56,238 in 2007. The majority of the monitored facilities are under the jurisdiction of the TCEQ, with the most of remainder under the jurisdiction of the RCT.

The TWDB, GCDs, and the USGS conduct nonregulatory groundwater monitoring to assess ambient or existing groundwater quality conditions and to track changes in water quality over time. Some monitoring programs are developed for the assessment of water quality that target specific geographic areas, contaminants, constituents, or activities. Contamination cases discovered by these agencies or entities through groundwater studies, or groundwater sampling programs, are referred to the regulatory agency with the appropriate jurisdiction.

The TWDB reported sampling approximately 569 sites in 2006 and 520 sites (wells and springs) in 2007. TWDB's collection of these samples and analysis of additional samples from cooperative entities comprise the state's ambient groundwater quality-sampling program. TWDB enters water-quality data collected under this program in its groundwater database.

Groundwater Contamination

Groundwater contamination is defined by the TGPC for inclusion in the *Joint Report* (31 TAC Chapter 601, Appendix 5). Contamination is the detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater reasonably suspected of having been caused by the activities of entities under the jurisdiction of the state agencies. The TGPC recognizes that groundwater contamination may result from many sources, including: agricultural activities; commercial and business endeavors; current and past oil and gas production and related practices; domestic activities; industrial and manufacturing processes; and natural sources that may be influenced by, or may be the result of, human activities.

The contamination cases identified in the *Joint Report* are primarily those where contaminants have been discharged to the surface, to the shallow subsurface, or directly to groundwater from activities such as the storage, processing, transport, or dis-

posal of products or waste materials. The most common contaminants reported in both 2006 and 2007 were gasoline, diesel fuel, and other petroleum products due to the large number of cases related to petroleum storage tank systems. Less common reported contaminants were organic compounds (such as phenol, trichloroethylene, carbon tetrachloride, dichloroethylene, and naphthalene), pesticides (such as alachlor, atrazine, bromacil, dicamba, and prometon), creosote constituents, solvents, heavy metals, and sodium chloride.

Currently, there are 5,267 cases of documented groundwater contamination. Approximately 92.8 percent of the documented cases in 2007 are under the jurisdiction of the TCEQ. The remainder are under the jurisdiction of the RCT (with approximately 7.1 percent), and GCDs which are members of TAGD (with 1 case, or less than 0.1 percent).

Table 2 lists the documented groundwater contamination cases reported by each agency with enforcement jurisdiction and is further broken down by program within the agency.

Table 2 illustrates the total percentage of documented cases attributable to each agency and program and the net change and percentage change from 2006 to 2007. The *Joint Report* for both 2006 and 2007 document the large number of groundwater contamination cases attributed to leaking underground storage tanks. As reported by the TCEQ, the number of documented groundwater contamination cases resulting from the failure of storage tank systems declined from 3,465 in 2006 to 3,054 in 2007. This is down from a high of 3,867 cases in 2005. These cases represent 62.1% of the total number of documented contamination cases in 2006 and 57.9% of the total cases in 2007.

While the number of documented contamination cases from underground storage tanks is high compared to other programs, it can be directly linked to the large number of regulated facilities. In 2007, there were 69,483 facilities containing registered storage tanks.

Table 2 also illustrates an increase in the number of active cases reported by the RCT. The RCT case count rose 6.2 percent between 2006 and 2007. Most of these cases are under the jurisdiction of the Oilfield Cleanup Program.

The TCEQ programs with increase in the number of active cases between 2006 and 2007 are the Voluntary Cleanup/Innocent Owner Program (54 cases), Corrective Action Program (eight cases), Dry Cleaner Remediation Program (59 cases), Super Site Discover and Assessment Program (two cases), and Municipal Solid Waste (13 cases).

Table 2. Groundwater Contamination Cases by Jurisdictional Agency, 2006–2007

Agency Division Program	Total Cases		Change, 2006-2007		Percent of Total	
	2006	2007	Net	%	2006	2007
Texas Commission on Environmental Quality						
<i>Radioactive Materials Division programs</i>						
Radioactive Materials Licensing	NA	2	2	0	NA	0.1
Uranium and Technical Assessments	NA	1	1	0	NA	0.1
<i>Remediation Division programs:</i>						
Brownfield Site Assessment	8	6	-2	-25	0.1	0.1
Corrective Action	567	575	8	1.4	10.2	10.9
Dry Cleaner Remediation	68	127	59	86	1.2	2.4
Innocent Owner/Operator	185	239	54	29	3.3	4.5
Petroleum Storage Tank	3,465	3,054	-411	-11.8	62.1	57.9
Superfund Cleanup	69	69	0	0	1.2	1.3
Superfund Site Discovery and Assessment	16	18	2	12.5	0.2	0.3
Voluntary Cleanup	708	704	-4	-0.5	12.7	13.4
<i>Waste Permits Division programs:</i>						
Municipal Solid Waste	46	59	13	28.3	0.8	1.1
Industrial and Hazardous Waste	6	6	0	0	0.1	0.1
<i>Water Quality Division</i>						
Water Quality Assessment Program	13	13	0	0	0.2	0.2
<i>Water Supply Division programs:-</i>						
Public Drinking Water	12	9	-3	-25	0.2	0.1
Water Rights Permits and Availability	48	5	-43	-90	0.8	0.1
<i>Enforcement Division</i>	4	4	0	0	0.1	0.1
<i>Field Operations Division</i>	4	2	-2	-50	0.1	0.1
Subtotal, all TCEQ programs	5,223	4,893	-330	-6.3	93.7	92.9
Department of State Health Services	1	NA	-1	-100	0.1	0
Railroad Commission of Texas						
<i>Oil and Gas Division</i>	351	373	22	6.26	6.2	6.6
Texas Alliance of Groundwater Districts	1	1	0	0	0.1	0.1
Total	5,576	5,267	-309	-5.54	100	100

The *Joint Report* also indicates the status of enforcement action for each instance of groundwater contamination. For purposes of the *Joint Report*, enforcement action includes any agency action that accomplishes or requires the identification, documentation, monitoring, assessing, or remediation of groundwater contamination. In general, regulatory programs are structured to achieve the desired degree of environmental protection and mitigation with the lowest possible level of agency oversight, and while the status of a contamination case may remain at an agency action level for a long period, physical activities related to the assessment and remediation may change often. The comparison of the level of agency action and the status or level of contamination assessment and mitigation allows a one-to-one correspondence between an agency's response (enforcement status) and the completion of the discrete phases in the progression of contamination investigation (activity status).

Table 3 presents the activity status of documented groundwater contamination cases through December 31, 2007. The table indicates the total number of documented cases by the agency (and division or program) with jurisdictional authority and indicates the activity status for the cases. Once groundwater contamination has been confirmed, either the regulated entity or the agency will address the groundwater contamination incident following a general sequence of actions until the investigation concludes that no further action is necessary. All of the 5,267 cases listed in the 2007 report had documented groundwater contamination (Table 3). The status of these cases is:

- “No Activity” has occurred on 157 reported cases that are awaiting confirmation of contamination.
- “Contamination Confirmed” (validated) for 799 cases.
- “Ongoing Investigation” is taking place at 1,978 cases.
- “Corrective Action Planning” is being conducted for 261 cases.
- “Corrective Action Implemented” on 759 cases.
- “Monitor Action” for effectiveness is occurring in 442 cases.
- “Action Completed” (No further action is necessary) for 1,102 cases.
- “No Activity” was provided for two cases.

Historically, the number of new groundwater contamination cases documented each year has been greater than the number of cases in which action was completed during the same year. This trend had held since the TGPC began publishing the *Joint Report* in 1989, but in 2000, the trend reversed. In 2006, 884 cases were listed as action completed, and 548 new cases were reported. In 2007, 1,102 cases were listed as action completed, with 566 new cases reported. A summary of the changes since 1998 is contained in the 2007 report.

Table 3. Documented Groundwater Contamination Cases by Agency/Activity Status, 2007

Agency Division Program	Cases, 2007		Cases with an Activity Status Code ^{3,4} of ...							
	Total ¹	New ²	0	1	2	3	4	5	6	None
Texas Commission on Environmental Quality										
<i>Enforcement Division</i>	4	0	0	1	2	0	1	0	0	0
<i>Field Operations Division</i>	2	0	0	0	2	0	0	0	0	0
<i>Radioactive Materials Division Programs</i>										
Radioactive Materials Licensing	2	0	0	0	2	0	0	0	0	0
Uranium and Technical Assessments	1	0	0	0	0	0	0	0	0	1
<i>Remediation Division programs:</i>										
Brownfield Site Assessment	6	1	0	1	2	0	1	0	0	0
Corrective Action	575	31	5	24	238	142	164	196	10	1
Dry Cleaner Remediation	127	56	2	7	119	1	0	1	4	0
Innocent Owner/Operator	239	54	35	182	0	0	0	0	22	0
Petroleum Storage Tank	3,054	263	0	439	1,272	0	350	0	993	0
Superfund Cleanup	69	2	0	3	15	8	9	34	1	0
Superfund Site Discovery and Assessment	18	5	7	5	5	0	0	0	1	0
Voluntary Cleanup	704	77	111	102	258	43	76	77	38	0
<i>Waste Permits Division programs:</i>										
Municipal Solid Waste	59	12	0	0	3	8	16	14	4	0
Industrial and Hazardous Waste	6	2	0	0	0	3	2	0	1	0
<i>Water Quality Division</i>										
Water Quality Assessment Program	13	0	0	1	5	1	5	1	0	0
<i>Water Supply Division programs:</i>										
Public Drinking Water	9	9	0	0	0	0	0	0	9	0
Water Rights Permits and Availability	5	0	0	2	3	0	0	0	0	0
Subtotal, all TCEQ programs	4,893	512	160	767	1,926	206	624	323	1,083	2
Railroad Commission of Texas										
<i>Oil and Gas Division</i>	373	54	0	31	22	55	134	112	19	0
Texas Alliance of Groundwater Districts	1	0	0	0	0	0	1	0	0	0
Total	5,267	566	160	798	1,948	261	759	435	1,102	2

1. Total number of groundwater contamination cases documented or under enforcement during calendar year 2007.
2. Number of new cases documented or under enforcement during calendar year 2007.
3. Key to activity status codes: 0—No Activity; 1—Contamination Confirmed; 2—Ongoing Investigation; 3—Corrective Action Planning; 4—Corrective Action Implementation; 5—Monitoring Action; 6—Action Completed
4. Facilities may have more than one activity status code.

Appendix 5. Texas Groundwater Protection Committee Rules

Title 31. NATURAL RESOURCES AND CONSERVATION

Part 18. TEXAS GROUNDWATER PROTECTION COMMITTEE

Chapter 601. GROUNDWATER CONTAMINATION REPORT

Subchapter A. GENERAL PROVISIONS RELATING TO PUBLIC FILES AND JOINT REPORT

§601.1 Purposes of Rules

The purposes of this chapter are:

- (1) to implement duties and responsibilities assigned to the committee under Texas Water Code, §26.406, concerning the maintenance by member agencies of public files containing documented cases of groundwater contamination and the publication by the committee, in conjunction with the commission, of annual groundwater monitoring and contamination reports;
- (2) to establish general policies of the committee to guide that implementation; and
- (3) to specify the form and content of the notice of groundwater contamination required under Texas Water Code, §26.408.

§601.2 Applicability

These rules specifically apply to each state agency or organization having membership on the committee. The committee is composed of:

- (1) the Texas Commission on Environmental Quality;
- (2) the Department of State Health Services;
- (3) the Texas Department of Agriculture;
- (4) the Railroad Commission of Texas;
- (5) the Texas Water Development Board;
- (6) the Texas Alliance of Groundwater Districts;
- (7) the Texas AgriLife Research;
- (8) the Bureau of Economic Geology of the University of Texas at Austin;
- (9) the State Soil and Water Conservation Board; and
- (10) the Water Well Drillers and Water Well Pump Installers Program of the Texas Department of Licensing and Regulation.

§601.3 Definitions

The following words and terms, when used in this chapter, have the following meanings.

- (1) Act—House Bill 1458 (71st Legislature, 1989) codified, with amendments, as Texas Water Code, §§26.401–26.408.
- (2) Commission—Texas Commission on Environmental Quality.
- (3) Committee—Texas Groundwater Protection Committee.
- (4) Documented groundwater contamination—A case of groundwater contamination in which a member agency has an established procedure for making a determination based on the quality of groundwater and the information pertinent to making the determination is maintained by that member agency under §601.4(b) of this title (relating to Public Files).
- (5) Enforcement action—Any action of the member agencies, identified in §601.2 of this title (relating to Applicability), that accomplishes or requires the identification,

documentation, monitoring, assessing, or remediation of groundwater contamination.

- (6) Groundwater—Water below the land surface in a zone of saturation.
- (7) Groundwater contamination—The detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater. Except for an underground source of drinking water granted an aquifer exemption by the commission with concurrence from the United States Environmental Protection Agency in accordance with 40 Code of Federal Regulations Parts 144–146, and 30 TAC Chapter 331 (relating to Underground Injection Control), groundwater contamination, for purposes of inclusion of cases in the public files and the joint groundwater monitoring and contamination report, is limited to contamination reasonably suspected of having been caused by activities or by entities under the jurisdiction of the member agencies identified in §601.2 of this title (relating to Applicability) and affecting groundwater that contains a concentration of:
 - (A) less than or equal to 10,000 milligrams per liter (mg/liter) of dissolved solids; or
 - (B) greater than 10,000 mg/liter of dissolved solids if it is:
 - (i) currently extracted for beneficial use such as domestic, industrial, or agricultural purposes; or
 - (ii) hydrologically connected with, and with the potential for contaminant movement to, a surface water body or another zone of groundwater that has a concentration of less than or equal to 10,000 mg/liter of dissolved solids.
- (8) Member agency—A state agency or organization designated by law under Texas Water Code, §26.403(c), to serve on the committee and be subject to its rules. Member agencies are listed in §601.2 of this title (relating to Applicability). Member agencies having responsibilities related to protection of groundwater include the commission, the Department of Agriculture, the Railroad Commission of Texas, and the State Soil and Water Conservation Board.

§601.4 Public Files

- (a) Subject to the limitations provided by Texas Water Code, §§26.401–26.408 (the Act), and the Texas Public Information Act, Texas Government Code, Chapter 552, information collected, assembled, or maintained by the committee and the member agencies having responsibilities related to protection of groundwater under the Act is a public record open to inspection and copying during regular business hours.
- (b) Each member agency having responsibilities related to the protection of groundwater under the Act shall maintain a public file of all documented cases of groundwater contamination that are reasonably suspected of having been caused by activities regulated by the member agency.

§601.5 Joint Groundwater Monitoring and Contamination Report

In conjunction with the commission, the committee shall publish not later than April 1 of each year a joint groundwater monitoring and contamination report covering the activities and findings of the committee made during the previous calendar year. The report must:

- (1) describe the current status of groundwater monitoring programs conducted by or required by each member agency at regulated facilities or in connection with regulated facilities;
- (2) contain a description of each case of groundwater contamination documented during the previous calendar year and of each case of groundwater contamination documented during previous years for which enforcement action was incomplete at the time of issuance of the preceding report; and
- (3) indicate the status of enforcement action for each case of groundwater contamination that is included in the report.

Subchapter B. NOTICE OF GROUNDWATER CONTAMINATION

§601.10 Form and Content of Groundwater Contamination Notice

When notice of groundwater contamination, as defined in §601.3(7) of this title (relating to Definitions), is provided under Texas Water Code, §26.408 to the owner of a private drinking water well that may be affected by the contamination and to each applicable groundwater conservation district, the notice shall:

- (1) be in writing; and
- (2) contain, at a minimum, the following information:
 - (A) the name of the contaminant or contaminants;
 - (B) the range of analytical results for the contaminant or contaminants measured in the area or well to date;
 - (C) possible health effects of the contaminant or contaminants;
 - (D) possible source or sources for this type of contamination;
 - (E) suggested actions and precautions potentially impacted well owners could take; and
 - (F) who to contact for more information.

Appendix 6. Select Publications of the TGPC

Texas Groundwater Protection Strategy. TCEQ publication AS-188 (February 2003).
<www.tceq.state.tx.us/assets/public/comm_exec/pubs/as/188.pdf>

Joint Groundwater Monitoring and Contamination Report – 2007. TCEQ publication SFR-056/07 (June 2008).
<www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/sfr/056_07/index.html>

Joint Groundwater Monitoring and Contamination Report – 2006. TCEQ publication SFR-056/06 (July 2007).
<www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/sfr/056_06/index.html>

Texas State Management Plan for Prevention of Pesticide Contamination of Groundwater. TCEQ publication SFR-070 (January 2001).
<www.tceq.state.tx.us/assets/public/comm_exec/pubs/sfr/070_01.pdf>

Texas Groundwater Data Dictionary. TCEQ publication GI-272 (August 1996). <www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-272.html>

Landowner's Guide to Plugging Abandoned Water Wells. TCEQ publication RG-347 (March 2006).
<www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/rg/rg-347.html>

Drinking Water Problems Fact Sheets

Arsenic. Texas AgriLife Extension Service publication (in English) L-5467 (December 2005) and (in Spanish) L-5467S (June 2006).

Perchlorate. Texas AgriLife Extension Service publication (in English) L-5468 (November 2005) and (in Spanish) L-5468S (February 2006).

Nitrates. Texas AgriLife Extension Service publication (in English) B-6184 (May 2006) and (in Spanish) B-6184S (May 2006).

Radionuclides. Texas AgriLife Extension Service publication (in English) B-6192 (July 2006) and (in Spanish) B-6192S (November 2006).

MTBE. Texas AgriLife Extension Service publication (in English) L-5502 (June 2008).

Note: These publications can be accessed at <http://agrilifebookstore.org>

On-site Wastewater Treatment Systems Fact Sheets

Homeowner's Guide to Evaluating Service Contracts. Texas AgriLife Extension Service publication (in English) B-6171 (July 2005).

Graywater. Texas AgriLife Extension Service publication (in English) B-6176 (October 2005).

Understanding and Maintaining Your Septic System. Texas AgriLife Extension Service publication (in English) L-5491 (March 2008).

Note: These publications can be accessed at <http://agrillifebookstore.org>

Water Wells Fact Sheet

Capping of Water Wells for Future Use. Texas AgriLife Extension Service publication (in English) L-5490 (August 2007).

Note: This publication can be accessed at <http://agrillifebookstore.org>

Pesticides Best Management Practices Trifold Brochure

Keep Pesticides Out of Texas Water Supplies – Best Management Practices to Prevent Pesticide Contamination. Texas AgriLife Extension Service publication (in English) L-5500 (July 2008).

Note: This publication can be accessed at <http://agrillifebookstore.org>